NG 22 (GROUP B)

PART I — ENGINEERING MATHEMATICS

(Common to all candidates)

(Answer ALL questions)

1. The eigenvalues of the matrix $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$ are

a. $-2, -3, 6$

b. $-2, 3, 6$

c. $2, -3, -6$

d. $2, 3, 6$

2. For what value of k, the matrix $A = \begin{bmatrix} 2 & k \\ 3 & 5 \end{bmatrix}$ has no inverse?

a. 3

b. $-10/3$

c. 2

d. $10/3$

3. The index and signature of the quadratic form $x_1^2 + 2x_2^2 - 3x_3^2$ are

a. Index = 2 ; Signature = –1

b. Index = 2 ; Signature = 1

c. Index = 1 ; Signature = 2

d. Index = 1 ; Signature = –2

4. If $u = x^2 + y^2$ then $\frac{\partial^2 u}{\partial x \partial y}$ is equal to

a. 2

b. 0

c. $2xy$

d. $2(x + y)$

5. If $x = u(1 - v)$ and $y = uv$ then the Jacobian $J\left(\frac{u, v}{x, y}\right)$ is

a. $x + y$

b. $\frac{1}{x + y}$

c. 1

d. xy

6. The Taylor's expansion of the function $f(x) = \frac{1}{1 + x^2}$ is

a. $\sum_{n=0}^{\infty} (-1)^n x^{2n}$ for $-1 < x < 1$

b. $\sum_{n=0}^{\infty} x^{2n}$ for $-1 < x < 1$

c. $\sum_{n=0}^{\infty} (-1)^n x^n$ for $-1 < x < 1$

d. $\sum_{n=0}^{\infty} (-1)^n x^{2n}$ for any real x

7. If $\vec{F} = x^2yz\,\hat{i} + xy^2z\,\hat{j} + xyz^2\,\hat{k}$ then $div\,\vec{F}$ at (1, 2, 3) is

a. 1

b. 6

c. 12

d. 24

8. The work done in moving a particle by the force $\vec{F} = (5xy - 6x^2)\hat{i} + (2y - 4x)\hat{j}$ from (1, 1) to (2, 8) along $y = x^3$ is

a. 24

b. 35

c. 48

d. 70

9. The value of $\oint_{|z|=1} \frac{z^2}{(2z-1)^2}$ is

a. $2\pi i$

b. πi

c. $\pi i / 2$

d. $4\pi i$

10. The fixed points of the mapping $w = \frac{5z+4}{z+5}$ are

a. 2, 2

b. 2, –2

c. –2, –2

d. –4/5, 5

11. The residue of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ at $z = 1$ is

a. 4/9

b. 5/9

c. 1/3

d. 1/9

12. The inverse Laplace transform of $\frac{1}{(s+a)^2}$ is

a. e^{at}

b. e^{-at}

c. te^{-at}

d. te^{at}

13. Using Parsevel's identity of Fourier transform, the value of $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)}$ is

a. $\frac{\pi}{a+b}$

b. $\frac{\pi}{ab(a+b)}$

c. $\frac{\pi}{2ab(a+b)}$

d. $\frac{\pi}{2(a+b)}$

14. The Z transform of $\frac{1}{(n+1)!}$ is

a. $e^{1/z}$

b. $ze^{1/z}$

c. $ze^{1/z} - 1$

d. $z(e^{1/z} - 1)$

15. The approximate value of the roots of the equation $x^3 + x - 1 = 0$ lying in the interval (0, 1) using the method of false position with two iteration is given by

a. 0.61

b. 0.72

c. 0.74

d. 0.64

16. The fourth divided difference of the polynomial $3x^3 + 11x^2 + 5x + 11$ over the points $x = 0, 1, 4, 6, 7$ is

a. 18

b. 11

c. 3

d. 0

17. Simpson's rule for evaluation of $\int_a^b f(x)\,dx$ requires the interval (a, b) to be divided into

a. $3n$ intervals

b. $(2n + 1)$ intervals

c. $2n$ intervals

d. $(3n + 1)$ intervals

18. Given that E and F are events such that $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, the value of $P(E / F)$ is

a. 2/3

b. 1/3

c. 1/2

d. 1/5

19. If X has uniform distribution in (–1, 3) and Y has exponential distribution with parameter λ, then the value of λ such that $Var(X) = Var(Y)$ is

a. 4/3

b. 3/4

c. $\frac{2}{\sqrt{3}}$

d. $\frac{\sqrt{3}}{2}$

20. If the correlation coefficient is zero then the two lines of regression are

a. parallel

b. perpendicular

c. coincident

d. inclined at 45° to each other

PART II — BASIC ENGINEERING AND SCIENCES

(Common to all candidates)

(All correct answers upto a maximum number of 20 will be given credit, but all wrong answers will be taken into account for negative marking)

21. _____ law defines the absolute zero of entropy

a. Zeroth law
b. First law
c. Second law
d. Third law

22. Streamline, pathline and streakline are identical when the flow is

a. steady
b. uniform
c. unsteady
d. neither steady nor uniform

23. _____ relates to the United Nations Framework Convention on Climate Change by committing industrialized countries and economies to limit and reduce greenhouse gases (GHG) emissions.

a. Montreal protocol
b. Nagoya protocol
c. Kyoto protocol
d. Cartegena protocol

24. When the length of the conductor is doubled and the area of cross-section remains the same then its resistivity

a. Remains the same
b. Will be doubled
c. Will become half
d. Will increase by four times

25. The variables which can be accessed by all modules in a program are called

a. external variables
b. local variables
c. internal variables
d. global variables

26. How many memory locations would be reserved for the following program?

```
main()
{
    int i[10];
    char c[10];
    long l[10];
}
```

a. 90
b. 30
c. 70
d. 50

27. Find the output of the C code.

```
#include <stdio.h>
int main()
{
    const int ary[4] = {1, 2, 3, 4};
    int *p;
    p = ary + 3;
    *p = 5;
    printf("%d\n", ary[3]);
}
```

a. 4
b. 5
c. Compile time error
d. 3

28. Find the output of the C code.

```
#include <stdio.h>
void main()
{
    int h = 8;
    int b = h++ + h++ + h++;
    printf("%d\n", h);
}
```

a. 9
b. 10
c. 12
d. 11

29. The reason for the implementation of the cache memory is

a. To increase the internal memory of the system

b. The difference in speeds of operation of the processor and memory

c. To reduce the memory access and cycle time

d. All of the above

30. The contents of the EPROM are erased by

a. Overcharging the chip

b. Exposing the chip to UV rays

c. Exposing the chip to IR rays

d. Discharging the Chip

31. A coal containing high amount of volatile matter will have

a. Very little ash content

b. Low ignition temperature

c. High fusion point of its ash

d. Low adiabatic flame temperature

32. Consider a reaction aC + bD → Products. When the concentration of both the reactants C and D is doubled, the rate increases eight times. However, when the concentration of C is doubled, keeping the concentration of D fixed, the rate is doubled. The overall order of the reaction is

a. 0

b. 1

c. 2

d. 3

33. 10800 C of electricity passed through the electrolyte deposited 2.977 g of metal with atomic mass 106.4 g mol^{-1}. The charge on the metal cation is

a. +4

b. +3

c. +2

d. +1

34. Two sounds differ in sound level by 1.00 dB. The ratio of the greater intensity to the smaller intensity is

a. 10

b. 100

c. $10^{0.1}$

d. $10^{0.01}$

35. The maximum spectral radiancy for a black body at 2000 K lies in the infrared region. _____ in the _____ of that black body shifts the maximum into the visible range.

a. An increase, temperature

b. Decrease, temperature

c. An increase, pressure

d. Decrease, pressure

36. Lasers used in CD and DVD players are

a. He-Ne laser

b. CO_2 laser

c. Semiconductor lasers

d. Dye lasers

37. A typical relative refractive index difference between the core and the cladding of an optical fiber designed for long distance transmission is 1%. The numerical aperture for the fiber when the core index is equal to 1.46 is

a. 0.21

b. 0.15

c. 0.10

d. 0.03

38. The coordination number and the atomic packing factor for the HCP structure are

a. 8 and 0.68, respectively

b. 8 and 0.74, respectively

c. 12 and 0.68, respectively

d. 12 and 0.74, respectively

39. The ductile and brittle fractures occur because of

a. crack propagation only
b. plastic deformation only
c. plastic deformation and crack propagation, respectively
d. crack propagation and plastic deformation, respectively

40. In a ferromagnetic material, susceptibility is

a. very large and negative
b. very large and positive
c. zero
d. negative

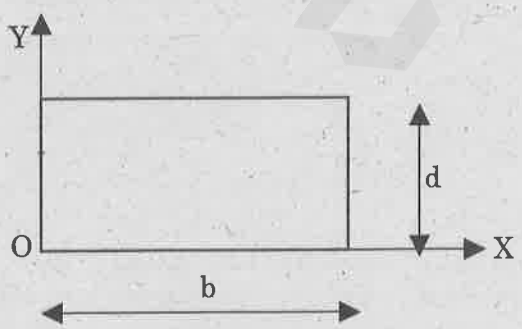
41. Fermi level for extrinsic semiconductor depends on

a. Donor element
b. Impurity concentration
c. Temperature
d. All of the above

42. Three forces A, B, and C of magnitude 8 N, 12 N and 20 N acting on a particle are in equilibrium. It can be concluded that

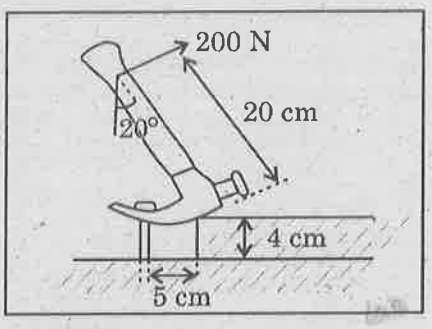
a. A and B act at 90°
b. One of the forces is non-coplanar
c. B and C act in opposite directions
d. One of the forces is non-concurrent

43. Polar moment of inertia of given rectangular area is



a. $(bd^3 + db^3) / 12$
b. $(bd^3 + db^3) / 3$
c. $bd^3/12$
d. $db^3 / 12$

44. The extraction of a nail is greatly facilitated by a block placed under the head of a claw hammer. Consider a 200 N pull on the handle, which is required to pull the nail. Calculate the tension in the nail.

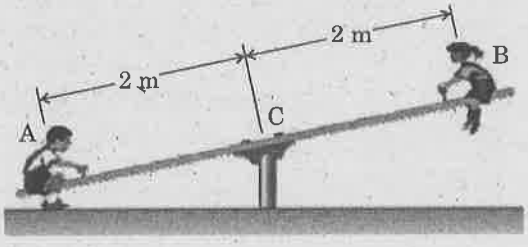


a. 800 N
b. 200 N
c. 400 N
d. 1000 N

45. Consider a particle moving along 1 dimension (X coordinate) with an acceleration $a(t) = 3t^2 + 5t + 1$ m/s², where "t" is time in seconds. At t = 0, velocity (v) = 4 m/s. What is the velocity (v) in m/s at t = 3 s?

a. 5.65 m/s
b. 65.5 m/s
c. 56.5 m/s
d. 6.55 m/s

46. The weight of two children sitting at ends A and B of a seesaw are 420 N and 320 N respectively. Where should a third child sit so that the resultant of the weights of the three children will pass through C if she weighs 300 N?



a. 0.5 m
b. 1 m
c. 1.5 m
d. 0.667 m

47. The ideal gas is characterized by

a. finite intermolecular forces and molecules are made of point masses.

b. negligible intermolecular forces and molecules are made of point masses.

c. finite intermolecular distances and molecules are made of point masses.

d. finite intermolecular forces and molecules are made of infinitesimal masses.

48. While pressurising the air in a cycle pump, 100 kJ of work is supplied and 20 kJ of heat is rejected, the change in internal energy is

a. –120 kJ

b. +120 kJ

c. – 80 kJ

d. +80 kJ

49. Thermal equilibrium of a system is analysed based on the

a. first law of thermodynamics

b. second law of thermodynamics

c. third law of thermodynamics

d. zeroth law of thermodynamics

50. An ideal engine operates between 327 deg.C and 27 deg.C. If the engine produces, 300 kJ of work, the heat rejected by the engine is

a. 0 kJ

b. 100 kJ

c. 200 kJ

d. 300 kJ

51. SCR (Short Circuit Ratio) of a synchronous machine is defined as:

a. $\frac{1}{Xs(Unsaturated)}$

b. $\frac{1}{Xs(Unsaturated)(per\ unit)}$

c. $\frac{1}{Xs(saturated)(per\ unit)}$

d. $\frac{1}{Xs(saturated)}$

52. In a cylindrical rotor synchronous machine, the phasor summation of stator MMF and rotor MMF is possible because:

a. The two MMF are rotating in opposite directions

b. Two MMF are rotating in same direction

c. One MMF is stationary and the other is rotating

d. Two MMF are stationary with respect to each other

53. A 250V, DC shunt motor having armature and field resistances of 0.05Ω and 50Ω, respectively, delivers 17.5kW output while drawing 20kW as input. What will be its armature copper loss when maximum efficiency is obtained?

a. 2219 W

b. 2500 W

c. 2469 W

d. 2782 W

54. The number of parallel paths in lap-wound armature are

a. Equal to the number of poles of the machine

b. Equal to two, irrespective of the number of poles

c. Equal to the number of commutator segments

d. Equal to the number of armature conductors

55. When the machine operates as a generator at load, the relation between induced EMF and terminal voltage is:

a. $E_g > V$

b. $E_g < V$

c. $E_b = V$

d. $E_b = 1$

PART III

06 – AUTOMOBILE ENGINEERING

(Answer ALL questions)

56. For an Oldham coupling used between two shafts, which among the following statements are correct?

I. Torsional load is transferred along shaft axis.

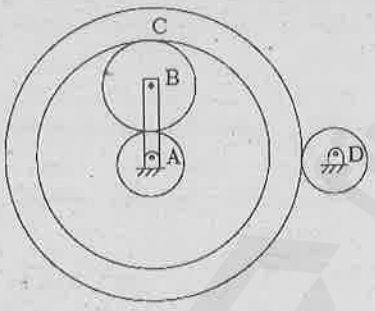
II. A velocity ratio of 1:2 between shafts is obtained without using gears.

III. Bending load is transferred transverse to shaft axis.

IV. Rotation is transferred along shaft axis.

a. I and III
b. II and IV
c. II and III
d. I and IV

57. An epicyclic gear train is shown in the figure below. The number of teeth on the gears A, B and D are 20, 30 and 20, respectively. Gear C has 80 teeth on the inner surface and 100 teeth on the outer surface. If the carrier arm AB is fixed and the sun gear A rotates at 300 rpm in the clockwise direction, then the rpm of D in the clockwise direction is

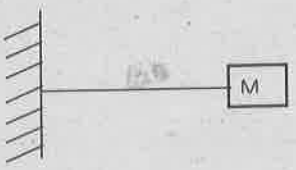


a. 300
b. 375
c. –75
d. –200

58. Pitch circle diameter of an involute gear is _____

a. independent of any other element
b. constant for a set of meshing gears
c. dependent on pressure angle
d. proportional to base diameter

59. A mass M of 20 kg is attached to the free end of a steel cantilever beam of length 1000 mm having a cross-section of 25 × 25 mm. Assume the mass of cantilever to be negligible and Esteel = 200 Gpa. If the lateral vibration of this system is critically damped using a viscous damper, then damping constant of the damper is



a. 1250 Ns/m
b. 625 Ns/m
c. 312.50 Ns/m
d. 156.25 Ns/m

60. Consider the following statements for a 4 cylinder in line engine whose cranks are arranged at regular intervals of 90°

I. There are 8 possible firing orders for the engine.

II. Primary force will remain unbalanced for some firing orders.

Which of the statements given above is correct?

a. I only
b. II only
c. Both I and II
d. Neither I nor II

61. A four bar mechanism is made up of links of length 100,200,300 and 350 mm. if the 350 mm link is fixed, the number of links that can rotate fully is

a. 2
b. 1
c. 3
d. 0

62. A cantilever beam of length 5m is subjected to an UDL of 2kN/m throughout the length of the beam. The maximum bending moment for the beam is

a. –25 kNm
b. –10 kNm
c. 10 kNm
d. 25 kNm

63. If the pressure angle of the rack is 20°, then force acting along the line of action between the rack and gear teeth is

a. 250 N
b. 342 N
c. 532 N
d. 600 N

64. In a cam-follower mechanism, the follower needs to rise through 20 mm during 60° of cam rotation, the first 30° with a constant acceleration and then with a deceleration of the same magnitude. The initial and the final speeds of the follower are zero. The cam rotates at a uniform speed of 300 rpm. The maximum speed of the follower is

a. 0.60 m/s
b. 1.20 m/s
c. 1.68 m/s
d. 2.40 m/s

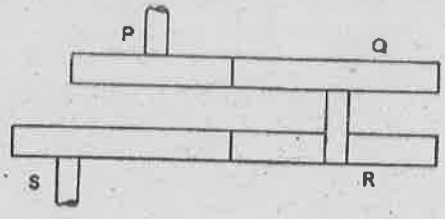
65. Two mating spur gears have 40 and 120 teeth respectively. The pinion rotates at 1200 rpm and transmits a torque of 20 Nm. The torque transmitted by the gear is

a. 6.6 Nm
b. 20 Nm
c. 40 Nm
d. 60 Nm

66. 100 kW power is supplied to the machine through a gear box which uses an epicyclic gear train. The power is supplied at 100 rad/s. The speed of the output shaft of the gear box is 10 rad/s in a sense opposite to the input speed. What is the holding torque on the fixed gear of the train?

a. 8 kNm
b. 9 kNm
c. 10 kNm
d. 11 kNm

67. In a reverted gear train, two gears P and Q are meshing, Q - R is a compound gear, and R and S are meshing. The modules of P and R are 4 mm and 5 mm respectively. The number of teeth in P, Q and R are 20, 40 and 25 respectively. The number of teeth in S is



a. 23
b. 35
c. 50
d. 53

68. The air standard efficiency of an Otto cycle is given by,

a. $\eta = 1 + \frac{1}{(r^{\gamma+1})}$
b. $\eta = 1 - \frac{1}{(r^{\gamma-1})}$
c. $\eta = 1 - \frac{1}{(r^{\gamma+1})}$
d. $\eta = 2 - \frac{1}{(r^{\gamma-1})}$

69. For the same compression ratio

a. Thermal efficiency of Otto cycle is greater than that of diesel cycle.
b. Thermal efficiency of Otto cycle is less than that of diesel cycle.
c. Thermal efficiency of Otto cycle is same as that of diesel cycle.
d. Thermal efficiency of Otto cycle cannot be predicted.

70. The efficiency of a Carnot engine using an ideal gas as the working substance is

a. $\frac{T1 - T2}{T1}$
b. $\frac{T1}{T1 - T2}$
c. $\frac{T1T2}{T1 - T2}$
d. $\frac{T1 - T2}{T1T2}$

71. The entropy may be expressed as a function of
a. Pressure and temperature
b. Temperature and volume
c. Heat and work
d. All of the above

72. Stefan- Boltzmann law is expressed as
a. $Q = \sigma AT^4$
b. $Q = \sigma A^2T^4$
c. $Q = \sigma AT^2$
d. $Q = AT^4$

73. The refrigerant, commonly used in vapour absorption refrigeration system is
a. Sulphur-di-oxide
b. Ammonia
c. Freon
d. Aqua ammonia

74. The following table shows the various casting defects and its causes. Identify the most appropriate cause for each defect.

Defect	Cause
A. Gas defect	i. Two stream do not fuse
B. Shrinkage cavities	ii. Incomplete mold cavity filling
C. Cold shut	iii. Lower venting
D. Misrun	iv. Liquid shrinkage

a. A – iii, B – i, C – iv, D – ii
b. A – iv, B – iii, C – ii, D – i
c. A – iii, B – iv, C – i, D – ii
d. A – ii, B – iii, C – iv, D – i

75. The following are true for rolling, except _____
a. velocity of metal at exit is same as that at the entry
b. grains are elongated in the direction of rolling
c. after crossing the stress zone the grain starts refining
d. the greater the coefficient of friction more the possible reduction

76. Which of the following is not a type of resistance welding?
a. Seam
b. Projection
c. Electro-slag
d. Spot

77. The thickness of the chip in upmilling is _____ when the cut terminates.
a. minimum
b. maximum
c. zero
d. depends on feed rate

78. Which of the following lathe part serves as a housing for the back gear, driving pulley etc?
a. tailstock
b. headstock
c. bed
d. toolpost

79. Point-to-point system is not suitable for _____
a. reaming
b. drilling
c. tapping
d. facing

80. In Reversed – Elliot type stub axle configuration the _____ prevents axial movement of stub axle.
a. Thrust washer
b. Pitman arm
c. Relay rod
d. U joints

81. When the teeth have worn out, the eccentric bush is rotated by certain angle for compensation in _____ steering gearbox?
a. Recirculating ball type
b. Worm and nut type
c. Rack and pinion type
d. Worm and wheel type

82. In modern passenger cars with live rear axle, the central tunnel may be avoided by using _____ type arrangement.
a. Straight bevel gear
b. Spiral bevel gear
c. Hypoid bevel gear
d. Worm and worm wheel

83. Which of the following is NOT taken by Torque tube in Torque tube type rear drive?
a. Side thrust
b. Torque reaction
c. Driving thrust
d. Braking torque

84. The brake foot pedal has a leverage of 5 is applied with a force of 200N. Calculate the force on the master cylinder piston.
a. 40 N
b. 205 N
c. 1000 N
d. 195 N

85. Which one of the following statements is/are true?
Statements:
i. Longer leaf springs gives a hard suspension
ii. Rear leaf springs are kept longer than the front leaf springs
iii. Shackle gives a flexible connection
a. i only
b. i and ii only
c. ii and iii only
d. i and iii only

86. Which one of the following is not related to fluid coupling?
a. Impeller
b. Turbine
c. Over running clutch
d. Drag torque

87. Calculate the force (tractive effort) that is required to overcome the gradient resistance of a vehicle weighing 3.5 tonnes on a gradient of 30°. Take g = 9.81 m/s^2
a. 17.167 kN
b. 17.167 N
c. 16 N
d. 106 N

88. Automatic transmission is a combination of _____
a. Fluid coupling and torque converter
b. Fluid coupling and ORC
c. ORC and Torque converter
d. Epicycle gear train and torque converter

89. Double declutching is a problem related to _____
a. Constant mesh gear box
b. Synchromesh gear box
c. Epicycle gear box
d. Sliding mesh gear box

90. To achieve reverse in simple epicycle gear box, reaction member is
a. Sun gear
b. Ring gear
c. Planed carrier
d. None of the above

91. Which of the following vehicle is pick-up or Truck as per body shape?
a. Vehicle with a separate cabin and rear load area or compartment
b. Vehicle having a passenger cabin with two rows of seats and integrated cargo space
c. A car body style with a folding or retracting roof(soft roof)
d. Vehicle with two rows of seats and a separate truck for luggage, at the rear

92. Quarter light is _____
a. The window directly above the quarter panel.
b. The side panel extending from door to the rear end of the body.
c. A raised floor panel section for driver shaft clearance.
d. The front lamp.

93. Spoilers on the front of a vehicle are often called _____
a. Air dam
b. Air cutter
c. Front wings
d. Aerofoil

94. Which one of the following is not a part of wind tunnel?
   a. Multiple axis force transducer
   b. Test section
   c. Blower
   d. Car model

95. Sill panel is _____
   a. Panel directly below the bottom of the door.
   b. The side panel extending from the door to the rear end of the body.
   c. A raised floor panel section for drive shaft clearance.
   d. Panel between the bonnet and wind screen.

96. The drag coefficient of a passenger car will be in the range of _____
   a. 0.7 – 0.9
   b. 0.5 – 0.6
   c. 0.3 – 0.4
   d. 0.1 – 0.3

97. The rolling resistance is because of the friction between the
   a. Wheel rim and tyre
   b. Tyre and the road surface
   c. Mating gears in the gear box
   d. Bearings and the crankshaft

98. What is the main purpose of the field coils in a DC motor?
   a. Create a stationary magnetic field
   b. Create a magnetic field in the armature
   c. Create a CEMF
   d. Reverse the polarity in the armature winding just as commutation occurs

99. A waveform repeats itself 60 times per second. What is the frequency of the waveform?
   a. 120 hertz
   b. 1 hertz
   c. 60 hertz
   d. 3600 hertz

100. Why are slip rings in an alternator necessary?
   a. They permit the stator to rotate.
   b. They provide a high resistance connection to the stator windings.
   c. They prevent a delta from forming.
   d. They permit current to flow through a rotating component called the rotor

101. A rectifier diode bridge is used to perform which operation in an alternator?
   a. Convert DC into AC
   b. Regulate voltage output
   c. Bridge the gap between the stator and the rotor
   d. Convert or rectify the negative half of a sine wave into the positive half of a sine wave

102. A lead acid battery is completely discharged. What can be said about the plate material and the electrolyte?
   a. Positive and negative plates have transformed into nearly the same lead material and the electrolyte has become mostly water.
   b. Positive and negative plates have transformed into sulfur and the electrolyte has become pure sulfuric acid.
   c. The electrolyte has become pure sulfuric acid and the plates have transformed into different compounds of lead.
   d. The plates have transformed into different compounds of lead and the electrolyte has become a mixture of water and sulfuric acid

103. Integral control has the advantage of :
   a. reducing steady state offsets
   b. reducing overshoot
   c. increasing stability
   d. all of the above

104. Overmixing in CI engines increases _____
   a. NOx emission
   b. HC emission
   c. Aldehyde emission
   d. Smoke emission

105. _____ is the reason for the black smoke in diesel engine
a. Unburned HC
b. CO
c. Soot
d. NOx

106. When EGR rate is increased, causes _____
i. Decreases the NOx emission
ii. Increases the HC emission
iii. PM emission decreased
a. i, ii only
b. ii, iii only
c. i, iii only
d. i, ii and iii

107. The NDIR analyzer works based on the principle of _____
a. Kirchhoff's law
b. Daltons law
c. Beer-lamberts law
d. Newton's law

108. By increasing exhaust gas temperature, catalytic converter efficiency _____
a. Increases
b. Decreases
c. No effect
d. Increases first and then decreases

109. Diesel oxidation catalyst is used for controlling _____
i. Hydrocarbon
ii. Carbon mono oxide
iii. Particulate matter
a. i, ii only
b. ii, iii only
c. i, iii only
d. i, ii and iii

110. The flammability limit of hydrogen in air (by volume) is
a. 4 : 1 – 75 : 1
b. 10 : 1 – 50 : 1
c. 5 : 1 – 15 : 1
d. 15 : 1 – 60 : 1

111. Smoke formation in the vegetable oil fuelled diesel engine is in the
a. Ignition delay period
b. Premixed combustion phase
c. Diffusion combustion phase
d. None of the above

112. Presence of oxygen in vegetable oil results in
a. Increasing the Calorific Value of the fuel
b. Reducing the calorific value of fuel
c. Increasing the viscosity of the fuel
d. Reducing the cetane number of the fuel

113. In dual fuel engine the combustion is controlled by the
a. Spark timing
b. Pilot fuel ignition
c. Primary fuel ignition
d. None of the above

114. The ignition energy required for hydrogen is
a. Higher than gasoline
b. Lower than gasoline
c. Equal to gasoline
d. Equal to diesel

115. The density of LPG as compared to air is
a. 0.5 to 1.5 times heavier
b. 1.5 to 2.0 times heavier
c. 2.0 to 2.5 times heavier
d. 2.5 to 3.0 times heavier

PART III

07 – AERONAUTICAL AND AEROSPACE ENGINEERING

(Answer ALL questions)

56. The 'work ratio' of gas turbine increases with
    a. increase in turbine inlet pressure
    b. decrease in compressor inlet temperature
    c. decrease in pressure ratio of the cycle
    d. all of the above

57. In rocket engines the amount of expansion in nozzle determines the
    a. exit temperature
    b. exit pressure
    c. exit temperature and pressure
    d. exit density

58. What is the value of propulsive efficiency when aircraft speed is equal to exhaust jet speed?
    a. 20%
    b. 100%
    c. 0
    d. 50%

59. Nozzles with high pressure ratios have _____ area divergent sections.
    a. variable
    b. constant
    c. maximum
    d. minimum

60. Convergent nozzles are used in jet engines up to nozzle pressure ratio of
    a. 0.8
    b. 1.8
    c. 2
    d. 1.5

61. Over expansion occurs when exit area of nozzle is _____ inlet area of the nozzle.
    a. Equal to
    b. Smaller than
    c. Greater than
    d. Independent on area of

62. What is the value of degree of reaction when the velocity triangle is symmetric?
    a. 80%
    b. 20%
    c. 10%
    d. 0

63. A turbine having alternate blades and nozzles is called as
    a. Impulse turbine
    b. Reaction turbine
    c. Impulse and Reaction turbine
    d. Francis turbine

64. Reaction turbine is also called as
    a. Impulse turbine
    b. Curtis wheel
    c. Parsons turbine
    d. Pelton turbine

65. Due to turbine cascade the drag _____ the lift.
    a. increases
    b. decreases
    c. does not change
    d. independent to

66. What is TIT?
    a. Turbine Inner Temperature
    b. Turbine Interstate Temperature
    c. Turbine Inlet Temperature
    d. Theoretical Inlet Temperature

67. Rocket propulsion usually operates in _____ mixture ratio.
    a. Fuel rich
    b. Oxidizer rich
    c. Stoichiometric
    d. Any of the above

68. The initial and final mass of the rocket engine are 200 kg and 130 kg respectively, average specific impulse of the propellant is 240 seconds and rocket operating duration is 3 seconds. What will be the value of thrust produced?
a. 54 KN
b. 24 KN
c. 32 KN
d. 68 KN

69. Which of the following below is used to compare the relative performance of different chemical rocket propellant system designs and propellants?
a. Effective exhaust velocity
b. Specific impulse
c. Characteristic velocity
d. Thrust

70. Lean mixtures give _____ efficiency.
a. Optimal
b. Higher
c. Lower
d. Poor

71. The degree of reaction is usually kept _____ for all types of axial flow compressors.
a. 0.2
b. 0.5
c. 0.3
d. 0.1

72. The following property is most important for material used for gas turbine blade
a. Creep
b. Fatigue
c. Corrosion
d. Toughness

73. In a centrifugal compressor, the ratio of the _____ to the blade velocity is called slip factor.
a. Inlet whirl velocity
b. Outlet whirl velocity
c. Inlet velocity of flow
d. Outlet velocity of flow

74. Only rocket engines can be propelled to space because
a. They can generate very high thrust
b. They have high propulsion efficiency
c. These engines can work on several fuels
d. They are not air breathing engines

75. In combustion chamber the smaller molecules will _____ the combustion.
a. Increase
b. Decrease
c. Not change
d. Stabilize

76. According to thin airfoil theory, the pitching moment of the airfoil at its quarter chord point is independent of
a. angle of attack
b. camber
c. angle of attack and camber
d. camber and free-stream velocity

77. If M is the Mach number of the flow, M^* is the characteristic Mach number and 'γ' is the ratio of specific heats, then as $M \to \infty$, $M^* \to$?
a. $\frac{\gamma+1}{\gamma-1}$
b. $\sqrt{\frac{\gamma+1}{\gamma-1}}$
c. $\sqrt{\frac{\gamma-1}{\gamma+1}}$
d. $\frac{2\gamma}{\gamma-1}$

78. A curve of enthalpy as a function of entropy for a constant value of mass flux for one dimensional adiabatic flow with wall friction is known as
a. Rayleigh line
b. Hugoniot line
c. Fanno line
d. Prandtl-Meyer line

79. Supersonic flow can be decelerated to subsonic if the passage ducts is
a. Converging
b. Diverging
c. Converging- diverging
d. Diverging-converging

80. Consider a two-dimensional body in supersonic flow with an attached oblique shock. An increase in freestream Mach number will cause the oblique shock wave to
a. move closer to the body
b. move away from the body
c. become a normal shock
d. detach from the body

81. The Schlieren flow visualization technique depends on
a. the variation of the value of density in the flow
b. the first derivative of density with respect to spatial coordinate
c. the second derivative of density with respect to spatial coordinate
d. the third derivative of density with respect to spatial coordinate

82. If 'θ' is flow deflection angle, 'V' is upstream velocity and 'M' is upstream Mach number of an expansion wave, then the differential governing equation for Prandtl-Meyer flow can be written as
a. $d\theta = \sqrt{(M^2-1)}\frac{dV}{V}$
b. $d\theta = \sqrt{(M^3-1)}\frac{dV}{V}$
c. $d\theta = -\sqrt{(M-1)}\frac{dV}{V}$
d. $d\theta = -\sqrt{(M^2-1)}\frac{dV}{V}$

83. The statement that 'the product of upstream and downstream velocities across a normal shock wave is equal to square of critical speed of sound' denotes
a. Euler's relation
b. Prandtl's relation
c. Meyer's relation
d. Rankine's relation

84. The tangential component of velocity in upstream and downstream regions across an oblique shock wave
a. remains constant
b. increases
c. decreases
d. becomes zero in downstream

85. Consider an elliptic lift distribution over a wing. Let 'K_0' be the circulation at mid span and '$2s$' be the span of major axis. Then the downwash is given by
a. K_0 / s
b. $K_0 / 2s$
c. $K_0 / 4s$
d. $K_0 / 8s$

86. The concept of zero drag on bodies immersed in a steady flow of ideal fluid is called
a. D'Alemberts paradox
b. Kelvin theorem
c. Helmholtz theorem
d. Biot Savart law

87. The optimum angle of attack of an aerofoil is the angle at which
a. the aerofoil produces maximum lift
b. the aerofoil produces zero lift
c. the highest lift/drag ratio is produced
d. the lowest lift/drag ratio is produced

88. As air flows over the upper cambered surface of an aerofoil, what happens to velocity and pressure?
a. Velocity increases, pressure increases
b. Velocity increases, pressure decreases
c. Velocity decreases, pressure decreases
d. Velocity decreases, pressure increases

89. In a forced vortex
a. the fluid velocity is inversely proportional to the radius
b. the fluid rotates without any relative velocity
c. the rise depends on the specific weight
d. the rise is proportional to the cube of angular velocity

90. According to small perturbation theory, the linearized pressure coefficient for a planar irrotational flow can be approximated as (where u' is perturbation in flow direction and V_∞ is freestream velocity)
a. u' / V_∞
b. $2u' / V_\infty$
c. $-u' / V_\infty$
d. $-2u' / V_\infty$

102. A closely coiled helical spring absorbs 80 N-mm of energy while extending by 4mm. The stiffness of the spring is
   a. 5 N/mm
   b. 10 N/mm
   c. 16 N/mm
   d. 20 N/mm

103. Angle ply laminate have
   a. Higher shear strength
   b. Higher bending stiffness
   c. Higher tensile strength
   d. Lower shear strength

104. For a linear strain triangular element the order of approximation for displacement is
   a. 1
   b. 3
   c. 4
   d. 2

105. Maximum stress failure and maximum strain failure theories gives identical results when
   a. Equal to zero
   b. The Poisson's ratio is greater than one
   c. The Poisson's ratio is less than one
   d. Equal to one

106. In a thick cylinder pressurized from inside, the Hoop stress is maximum
   a. At the center of the wall thickness
   b. At the outer radius
   c. At the inner radius
   d. Both the inner and outer radii.

107. The compatibility conditions in theory of elasticity ensures that
   a. There is compatibility between stress components
   b. Relationships between stresses and strains are consistent with the constitutive relations
   c. Displacements are single valued and continuous
   d. Stresses satisfy the bi-harmonic equation

108. A mild steel beam is subject to a bending moment such that a stress of 100 N/mm^2 is developed at a layer which is 10 cm from the neutral axis. If E = 200 kN/mm^2, the radius of curvature of the beam is
   a. 400 m
   b. 200 m
   c. 100 m
   d. 50 m

109. Two prismatic beams A and B have same length. The one having larger ———— will be stronger in flexture.
   a. Moment of inertia
   b. Section modulus
   c. Product of inertia
   d. Area of cross section

110. A plate is a member subjected to
   a. Bending only
   b. Twisting only
   c. Both bending and twisting
   d. Axial load

111. Divergence speed of a wing may be increased by
   a. Decreasing the wing stiffness
   b. Increasing the offset distance between aerodynamic center and center of twist
   c. Decreasing the offset distance between aerodynamic center and center of gravity
   d. Decreasing the offset distance between aerodynamic center and center of twist

112. A linear mass-spring-dashpot system is over-damped. In free vibration, this system undergoes
   a. Non-oscillatory motion
   b. Random motion
   c. Oscillatory and periodic motion
   d. Oscillatory and non-periodic motion

113. If the loading is with respect to the natural axis of a unidirectional lamina, then the lamina is called
   a. Isotropic
   b. Orthotropic
   c. Anisotropic
   d. Quasi isotropic

114. Flutter is associated with
   a. Steady amplitude oscillation
   b. Unsteady amplitude oscillation
   c. Quasi steady amplitude oscillation
   d. Neutrally damped oscillation

115. Shape function expression for a beam element with two degrees of freedom per node is of order
   a. 3
   b. 2
   c. 4
   d. 5

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114. Flutter is associated with
   a. Steady amplitude oscillation
   b. Unsteady amplitude oscillation
   c. Quasi steady amplitude oscillation
   d. Neutrally damped oscillation

115. Shape function expression for a beam element with two degrees of freedom per node is of order
   a. 3
   b. 2
   c. 4
   d. 5

PART III

08 - ARCHITECTURE

(Answer ALL questions)

56. _____ is a metamorphic rock
   a. granite
   b. basalt
   c. marble
   d. Laterite

57. _____ foundation is a special type of isolated footing generally provided for heavily loaded steel structures
   a. Pile
   b. Raft
   c. Grillage
   d. Strip

58. Excess Alumina in brick makes brick
   a. Crack
   b. Crack and warp on drying
   c. Reduce to powder
   d. Shrink

59. Testing compressive strength of cement size of cube used is
   a. 150mm
   b. 50mm
   c. 75mm
   d. 200mm

60. Seasoning of Timber
   a. To make it water resistant
   b. To increase the strength
   c. To paint the surface
   d. To remove water

61. Which of following is purest form of iron?
   a. Cast Iron
   b. Wrought iron
   c. Mild steel
   d. Hydrocarbon steel

62. Which changes are noted when glass is heated?
   a. It becomes brittle
   b. It bursts
   c. It becomes softer
   d. It solidifies

63. Which of the following is not a common property of plastics?
   a. Non-reactive
   b. Durable
   c. Light in weight
   d. Good conductor of Electricity

64. The main advantage of pre-stressed concrete piles over traditional reinforced concrete steel piles is _____
   a. Bean carrying capacity
   b. Moment carrying capacity
   c. Column carrying capacity
   d. Foundation carrying capacity

65. Ferro cement is a composite material consisting of the following
   a. Cement – lime mortar
   b. Cement – sand mortar with small diameter wire mesh
   c. Surki mortar with small diameter wire mesh
   d. Lime and sand mortar

66. Ribbed vault is a characteristic of
   a. Renaissance architecture
   b. Neo-classic architecture
   c. Gothic architecture
   d. Roman architecture

67. Cornice, Frieze and architrave are part of
   a. Entablature
   b. Pediment
   c. Shaft
   d. Base

68. Circus Maximus was a public space used for
a. Market activities
b. Horse Racing
c. Theatres and plays
d. Combats

69. Complexity and Contradiction in Architecture was written by
a. Charles Moore
b. Michael Graves
c. Charles Jencks
d. Robert Venturi

70. Cathedral of Brasilia was designed by
a. Oscar Niemeyer
b. Eric Mendelson
c. Walter Gropius
d. John Utzon

71. Bird's Nest, Beijing was designed by
a. P.L.Nervi
b. Santiago Calatrava
c. Herzog & de Meuron
d. Chris Bosse

72. Harmika and Torana are parts of
a. Chaityas
b. Viharas
c. Stupas
d. Stambhas

73. Pietra Dura refers to
a. Inlay work in stones and marbles
b. Street layout of Roman villages
c. Plan feature of a church
d. A type of Flemish bond

74. Kenzo Tange, Kiyonari kikutake, Kisho kurukawa were part of
a. Brutalist movement
b. Metabolism movement
c. De stijl movement
d. De constructivist movement

75. Which of the following was not designed by Anant Raje?
a. Indian Institute of forest management, Bhopal
b. Farmer's training Institute, Gujarat
c. MAFCO wholesale market, Mumbai
d. National institute of immunology, Delhi

76. Golden ratio is
a. 1.618
b. 1.816
c. 1.861
d. 1.168

77. What indicates a position in space?
a. line
b. point
c. plane
d. volume

78. What type of form composition is Habitat 97 by Moshe Safdie?
a. radial form
b. grid form
c. linear form
d. cluster form

79. What is the quality of surface treatment that is associated with materials?
a. Tone
b. Texture
c. Mass
d. Volume

80. The balanced distribution and arrangement of equivalent forms and spaces on opposite sides of a dividing line or plane or about a central axis is called
a. symmetry
b. rhythm
c. hierarchy
d. datum

81. Embryological house was a conceptual work of
a. Lars Spuybroek
b. Hani Rashid
c. Greg lynn
d. Neil Denari

82. "The next room is always where I need it to be" is a concept by Marcos Novak in
a. Robotic architecture
b. Kinetic architecture
c. Liquid architecture
d. Blobitecture

83. Spatial relation and rules are generally established for designing through
a. Shape grammar
b. Fractals
c. 3D animation
d. Motion kinematics

84. Which one of the following is not a characteristic of topological surfaces?
a. No strict definition of inside and outside
b. Un-orientable mathematical properties
c. Complexity of space
d. Euclidean geometry

85. Which of the following does not take inspirations from nature?
a. Bionic architecture
b. Genetic algorithms
c. NURBS and BLOBS
d. Emergence

86. The unit of illuminance is
a. Candela
b. Lux
c. Lumens per sqm
d. Lux per sqm

87. Out of the following,the quality of lighting is better when the Colour rendering index is
a. 10
b. 25
c. 55
d. 81

88. Traps are used to prevent
a. backflow
b. odour
c. insects
d. all of the above

89. As per NBC 2016, the value of water supply per head for communities with population 20,000 to 1,00,000 with flushing facility is
a. 50 -100 lpcd
b. 100 -135 lpcd
c. 135 – 200 lpcd
d. 220 lpcd

90. Bus bars are used in buildings for
a. Vertical transportation
b. Electricity distribution
c. Parking
d. None of the above

91. Daylight factor is
a. (Eo / Ei) × 100%
b. (Ei / Eo) × 100%
c. Ei / Eo
d. Eo / Ei

(Ei = illuminance due to daylight at a point on the indoors working plane, Eo = simultaneous outdoor illuminance on a horizontal plane from an unobstructed hemisphere of overcast sky.)

92. Mashrabiya refers to
a. A timber lattice window
b. A prayer space in mosque
c. Clerestory to provide light
d. Natural cooling system

93. Summer solstice in Northern hemisphere falls on
    a. June 20
    b. June 21
    c. March 20
    d. March 21

94. Water wall is provided for
    a. Passive heating
    b. Passive cooling
    c. Remove humidity
    d. Increase humidity

95. Wing wall is provided
    a. For induced ventilation
    b. Partition
    c. Dynamic facade
    d. To obstruct circulation

96. Pipes recommended for hot water supply in building is
    a. CPVC
    b. Copper
    c. Cast iron
    d. Lead

97. Jockey pumps are used in
    a. Fire safety systems
    b. Water supply system
    c. Building automation
    d. All of the above

98. Topiary refers to
    a. Ornamental clipping of vegetation
    b. Topography of the site
    c. Aerial photography
    d. Dry landscape

99. Root zone system is used in
    a. Effluent treatment
    b. Sustainable Landscape
    c. Landscape conservation
    d. None of the above

100. SCADA is
    a. A supervisory control
    b. Development Authority
    c. Energy efficient program
    d. Unit of optics

101. Strobe light refers to
    a. Emergency lighting
    b. Wall washer
    c. Focus lighting
    d. Ambient lighting

102. Reverberation time for medium sized, general purpose auditoriums is
    a. 1.5 seconds
    b. 2 seconds
    c. 1 second
    d. 2.5 seconds

103. Creep effect is experienced in
    a. Domes
    b. Pitched roofs
    c. Flat roofs
    d. Non parallel walls

104. Wind rose is a
    a. Diagram
    b. Hybrid variety
    c. Extinct flower
    d. Indigenous Indian flower

105. Wind towers are commonly found in
   a. Hot dry climatic zones
   b. Warm and humid climatic zones
   c. Tropical climatic zones
   d. Composite climatic zones

106. Who developed concentric zone theory?
   a. Gideon
   b. Burgess
   c. Tony Garnier
   d. Doxiadis

107. Housing for all was created by which nodal agency – by merging Rajiv Aawas Yojana and Rajiv Rinn Yojana?
   a. H.U.D.C.O + N.H.B
   b. H.D.F.C + N.H.B
   c. N.H.B
   d. N.A.B.A.R.D

108. When was the 1st ever Housing policy formulated in India?
   a. 1950
   b. 2007
   c. 1988
   d. 1994

109. Affordability level of MIG household is
   a. > 40% of gross monthly income
   b. > 30% of gross monthly income
   c. > 20% of gross monthly income
   d. > 10% of gross monthly income

110. Basic services of urban poor were made part of
   a. INSITU slum development
   b. National slum development program
   c. Slum rehabilitation scheme
   d. JNNURM

111. Belapur housing in Navi Mumbai was designed as part of
   a. MUDP
   b. JNNURM
   c. CIDCO
   d. IHUDP

112. Neighborhood concept was crystallized in early 1900s is by
   a. Fredrik law homestead
   b. C.A Perry
   c. Le Corbusier
   d. Frank loyd Wright

113. Ebenezer Howard built the following garden city
   a. Letch worth
   b. Kowloon
   c. Tel Aviv
   d. Hai Phong

114. Gentrification means
   a. Replacement of the low income residence with high income population
   b. Socio economic revival
   c. Restricted development
   d. Low density development

115. Satellite town means
   a. Outward growth of urban area
   b. Primarily dormitory settlement with functional dependency with parent city
   c. Infill growth in inner city
   d. Restricted growth in environmentally sensitive area

PART III

09 – AGRICULTURAL AND IRRIGATION ENGINEERING

(Answer ALL questions)

56. In a flange coupling, the flanges are coupled together by means of
   a. bolts and nuts
   b. studs
   c. headless taper bolts
   d. none of these

57. A man can develop
   a. 0.1 hp
   b. 0.5 hp
   c. 0.75 hp
   d. 1.0 hp

58. Carburettor is the main part of
   a. Diesel engine
   b. Petrol engine
   c. Gas engine
   d. Steam engine

59. National arid zone research institute is located in
   a. New Delhi
   b. Jaipur
   c. Jodhpur
   d. Ahmedabad

60. In arid zones afforestation provides a mechanical obstacle to the free sweep of wind, reducing in the process
   a. Wind velocity
   b. Soil erosion
   c. Evaporation from soil
   d. All of the above

61. Sediment deposit in reservoirs can be reduced by
   a. Avoiding reservoir sites which are prolific sources of sediment
   b. Adopting soil conservation measures in the catchment area
   c. Providing vegetative cover
   d. All of the above

62. Which of the following statement is false?
   a. The specific yield of an aquifer may be more than its porosity
   b. Flow in a medium sand aquifer is entirely laminar
   c. Plants usually extract water from the capillary zone
   d. Storage co-efficient is the same as specific yield for a water table aquifer.

63. In India, the variability of rainfall is least in
   a. Zones of high rainfall
   b. Zones of low rainfall
   c. Coastal areas
   d. Hilly areas

64. When the dynamic viscosity of a fluid is 0.6 poise and specific gravity is 0.6, the kinematic viscosity of that fluid will be
   a. 0.36 poise
   b. 0.6 poise
   c. 1 poise
   d. None of the above

65. The separation of flow occurs
   a. Due to reduction of pressure gradient to zero
   b. Due to reduction of pressure gradient to negligibly low value
   c. Under an adverse pressure gradient
   d. When the hydrodynamic boundary layer thickness is reduced to zero

66. The viscosity of a fluid with specific gravity 1.3 is measured to be 0.0034 Ns/m^2. Its kinematic viscosity in m^2/s is
   a. 2.6×10^{-6}
   b. 4.4×10^{-6}
   c. 5.8×10^{-6}
   d. 7.2×10^{-6}

67. Viscosity has dimensions of

a. $\frac{FT^2}{F}$

b. $\frac{F}{TL^2}$

c. $\frac{M}{LT^2}$

d. $\frac{M}{LT}$

68. The head loss in a pipe flow can be calculated by using

a. The Bernoulli equation
b. Darcy's law
c. The Chezy Manning equation
d. The Darcy Weisbach equation

69. Which one of the following soils may be expected to have higher percentage of silt?

a. Clay
b. Sand clay
c. Sand
d. Silty clay loam

70. A fibrous mass of organic matter in various stages of decomposition generally dark brown to black in colour and of spongy consistency, is known as

a. Murrum
b. Peat
c. Black expansive soil
d. Back fill

71. When water content in a soil is reduced beyond the shrinkage limit, the soil will be in

a. Solid state
b. Liquid state
c. Semi solid state
d. Plastic state

72. Which soil remains at the place of integration of parent rock?

a. Residual soil
b. Lacustrine soil
c. Aeolian soil
d. Alluvial soil

73. The uniformity coefficient of soil is

a. $\frac{D60}{D10}$

b. $\frac{D30}{D10}$

c. $\frac{D60}{D30}$

d. $\frac{D60}{D30xD10}$

74. The ratio of volume of irrigation water stored in the root zone and available for plant se to the volume delivered from irrigation system is called

a. Irrigation water use efficiency
b. Water conveyance efficiency
c. Water use efficiency
d. Irrigation application efficiency

75. The appearance of 'yellow colour' in soil is due to presence of

a. Hematite
b. Silicates
c. Limonite
d. Quartz

76. Which soil water is not available for plant growth?

a. Capillary water
b. Gravitational water
c. Hygroscopic water
d. Perched water

77. The irrigation method suitable for cotton potatoes etc is

a. Border strip method
b. Furrow method
c. Basin method
d. All of them

78. Maximum water application efficiency is in
a. Surface irrigation
b. Lift irrigation
c. Sprinkler irrigation
d. Furrow irrigation

79. The ratio of total volume of water delivered to a crop to the area on which it has been spread is called
a. Critical depth
b. Duty
c. Delta
d. Crop water depth

80. A cross drainage work which carries a canal over a channel without lowering the bed level of the channel is called
a. Aquaduct
b. Hybrid channel
c. Super passage
d. Siphon

81. The weed growth in canal
a. Reduces silting
b. Reduces discharge through the canal
c. Increases the velocity of flow
d. Increases the contamination of water

82. Evapo-transpiration is
a. Water equivalent to moisture contained in air which is lost through evaporation
b. Unaccounted loss of water by evaporation at a location
c. Evaporation from plants in a catchment area
d. The total evaporation and transpiration from the catchment area

83. _____ is used to find the water activity of a heterogeneous mixture of food
a. Salwin Slawson equation
b. BET isotherm equation
c. GAB isotherm equation
d. Rault's law

84. Gasification of biomass is a
a. Biochemical conversion process
b. Thermo chemical conversion process
c. Hydro chemical conversion process
d. Geochemical conversion process

85. The value of solar constant is approximately _____ kW/m^2
a. 3.64
b. 10
c. 1.36
d. 6.5

86. Wellner – Jelliner method is adopted in
a. Freezer
b. Evaporator
c. Separator
d. Mixer and blender

87. Quantitative Microbial Risk Analysis
a. Analyses health risks associated with contaminated drinking water
b. Analyses environmental flow
c. Analyses river water
d. Analyses health risks associated with wastewater use in agriculture

88. The specific heat of a grain at 12% m.c. wb whose specific heat at absolute dry condition is 0.42 will be _____ kcal / kg °C
a. 0.472
b. 0.372
c. 0.572
d. 0.742

89. Gable type is a _____ that is more suitable for rainfall areas
a. Hog house
b. Stanchion barn
c. Poultry house
d. Fish pond

90. 100 kg of milk with 7.5% fat content was fed into a cream separator and the cream obtained was 14.1 kg with 52.5% fat. The skimming efficiency of the cream separator is
a. 78.9%
b. 87.9%
c. 97.8%
d. 98.7%

91. Milk obtained by adding water, skimmed milk powder to the whole milk to get 3% fat and 8.5% SNF is called
   a. Homogenized milk
   b. Toned milk
   c. Standardized milk
   d. Reconstituted milk

92. The unit draft when a pair of bullocks pulls a plough with 85 kg draft at 3 kmph to make a furrow of 20 cm wide and 11 cm deep will be
   a. 0.863 ksc
   b. 0.944 ksc
   c. 0.386 ksc
   d. 0.386 psi

93. The ratio of Effective field capacity to Theoretical field capacity is called
   a. Machine efficiency
   b. Field efficiency
   c. Custom efficiency
   d. Mechanical efficiency

94. The total draft required for a plough is measured by
   a. Dynamometer
   b. Chartometer
   c. Speedometer
   d. Pyrometer

95. In a tyre size of 10 x 38, 10 represents
   a. Cross-sectional diameter in inches
   b. Rim diameter in inches
   c. Pressure of tyre in psi
   d. Pressure of tyre in ksc

96. A fan running at a speed of 473 rpm and delivering 14850 cub ft /min requires 3.18 HP. If the fan is to run at 537 rpm and deliver 16850 cub ft / min, the HP required is
   a. 6.45
   b. 4.65
   c. 4.56
   d. 5.64

97. The angles of intersection of two plane mirrors of an optical square is
   a. 15°
   b. 22.5°
   c. 30°
   d. 45°

98. Hour system is mostly used in
   a. Geological survey
   b. Astronomy
   c. Navigation
   d. (b) and (c) above

99. The total depth of irrigation to crop
   a. Delta
   b. Base
   c. Intensity of irrigation
   d. None of the above

100. The volume of water discharged per unit of time from the well is called
   a. Capacity of well
   b. Well yield
   c. Well stock
   d. None of the above

101. Which of the following is low volume sprayer?
   a. Gear type rotary pump
   b. Roller vane rotary pump
   c. Plunger pump
   d. All of the above

102. Which of the following statements is correct regarding transpiration?
   a. It creates suction force and help in the ascent of sap
   b. It affects the diffusion pressure deficit
   c. It maintains the temperature for the leaves
   d. All of the above

103. Which one is used for primary tillage?
   a. Hand hoe
   b. Deshi plough
   c. Mould board plough
   d. Blade harrow

104. The single cylinder engine is generally used in
   a. Tractor
   b. Stationery tillage
   c. Motor cars
   d. Power tiller engine

105. Junker's calorimeter is used for determining the calorific value of
   a. Liquid fuels
   b. Solid fuels
   c. Gaseous fuels
   d. None of the above

106. Detonation refers to the
   a. Engine Knocking
   b. Engine speed
   c. Engine efficiency
   d. None of the above

107. In tractor engines, a commonly used thermostat valve is
   a. Bimetallic type
   b. Bellows type
   c. Both (a) and (b) type
   d. None of the above

108. A mould board plough which is suitable for ploughing along hillsides is
   a. One-way plough
   b. Two way plough
   c. Both (a) and (b) above
   d. Three way plough

109. An undisturbed soil surface of a furrow is
   a. Furrow slice
   b. Furrow wall
   c. Furrow crown
   d. Furrow back

110. Sweeps are used for
   a. Seedbed preparation
   b. Ridging
   c. Earthing plants
   d. Mulching

111. In power operated sprayer, the pump works at a pressure of
   a. 2-5 kg/cm^2
   b. 3-8.5 kg/cm^2
   c. 4-12 kg/cm^2
   d. 5-15 kg/cm^2

112. The operating speed of combine harvester varies within a range of
   a. 600-800 rpm
   b. 900-1000 rpm
   c. 600-1400 rpm
   d. Above 1500 rpm

113. Gully erosion is the advance stage of
   a. Splash erosion
   b. Sheet erosion
   c. Rill erosion
   d. All are correct

114. Grassed waterways are used as
   a. Diversion channels
   b. Outlets
   c. Inlet to terrace system
   d. Inlet

115. Present tractor population in India is around
   a. 1 million
   b. 1.5 million
   c. 2.5 million
   d. More than 3.5 million

PART III

10 - BIO-TECHNOLOGY

(Answer ALL questions)

56. The most comprehensive model depicting the growth of cell mass in a bioreactor is
   a. unstructured and un-segregated
   b. unstructured and segregated
   c. structured and un-segregated
   d. structured and segregated

57. In continuous cultivation, turbidostat is more stable than chemostat when the
   a. dilution rate is very low
   b. dilution rate is near maximum specific growth rate
   c. dilution is to be maintained at a constant rate
   d. cell density needs to be very high

58. In a stirred tank reactor, when the agitation rate is increased, the k_L and $k_L a$ values will
   a. increase and decrease respectively
   b. decrease and increase respectively
   c. increase in both
   d. decrease in both

59. For enzymes immobilized in a porous matrix, which of the following statements is true?
   a. The Thiele modulus is always infinity
   b. Mass transfer limits enzyme effectiveness
   c. Effectiveness factor is always unity
   d. Specific activity of the immobilized enzymes always increases

60. For mixing solid contents of the media in a media mixing tanks, inclined blade turbine is used because, it
   a. acts like an axial flow impeller with downward movement of liquid
   b. draws less power compared to flat blade turbine
   c. prevents vortex formation
   d. is a radial flow impeller with sideward movement of liquid

61. Which of the following method is not used for volumetric mass transfer coefficient determination?
   a. sodium-sulfite oxidation method
   b. dynamic method of gassing out
   c. static method of gassing out
   d. carbon dioxide balance method

62. Baffles are provided in CSTR for _____ of the velocity of fluid flow.
   a. retarding the radial component
   b. retarding the axial component
   c. retarding the circular component
   d. improving the radial component

63. Immobilization of enzyme by using calcium alginate is
   a. Entrapment
   b. Adsorption
   c. Covalent binding
   d. Ionic interaction

64. By double-reciprocal plot
   a. V_{max} can be estimated accurately
   b. K_m can be estimated accurately
   c. Both V_{max} and K_m can be estimated accurately
   d. V_{max} and K_m cannot be estimated

65. In transient flow regime, power number is _____ the Impeller Reynolds number
   a. directly proportional to
   b. inversely proportional to
   c. independent of
   d. non linearly related to

66. Connexon plays vital role in cell–cell junction of
   a. Tight junction
   b. Gap junction
   c. Desmosomes
   d. Hemidesmosome

67. The translocation of GLUT4 protein on the membrane is regulated by
   a. Glucagon
   b. Glucocorticosteroids
   c. Insulin
   d. Thyroid hormone

68. Calmodulin, IP3 and cGMP are examples of
   a. Vasodialators
   b. Neuro transmitters
   c. Second messengers
   d. Coenzymes

69. Ras protein is associated with the following function
   a. GTPase
   b. Adenylyl cyclase
   c. Phosphodiesterase
   d. ATPase

70. Which one of the following is not true about promoter?
   a. A binding site for RNA polymerase
   b. A binding site for transcription factor
   c. Located at upstream of coding region
   d. A binding site for Rho factor

71. Increased activity of Histone acetyltransferases leads to
   a. Up regulation transcription
   b. Down regulation transcription
   c. No effect on transcription
   d. Inhibit replication

72. Cell lines are kept and maintained in CO_2 incubators, wherein percentage of CO_2 is
   a. 1%
   b. 5%
   c. 10%
   d. 20%

73. DNA repair through Non-homologous end joining is due to
   a. Pyrimidine dimerization
   b. Missense mutation
   c. Single-strand breaks in DNA
   d. Double-strand breaks in DNA

74. Non disjunction during cell division leads to
   a. Unequal segregation of chromosomes in daughter cell
   b. Equal segregation of chromosomes in daughter cell
   c. Activation of p53
   d. Activation of Anaphase promoting complex

75. The sequences of codons that begin with a start codon and ends at a stop codon is
   a. Open reading frame
   b. Intron
   c. Nascent mRNA
   d. Closed reading frame

76. Increased levels of intracellular Inositol triphosphate (IP3) results in the release of Ca^{2+} from
   a. peroxisome
   b. lysosome
   c. mitochondrion
   d. endoplasmic reticulum

77. Which among the following is a precursor for glycogen?
   a. malate
   b. leucine and lysine
   c. UDP – Glucose
   d. glycerol 3 phosphate

78. Pepsin and urease are examples of this class of enzymes
   a. hydrolases
   b. oxidoreductases
   c. lyases
   d. ligases

79. The first enzyme to be discovered, diastase, was discovered by
   a. Pasteur
   b. Ansalme Payen
   c. Edward Buchner
   d. JB Sumner

80. Which of the following takes place in substrate level phosphorylation?
   a. Oxidation of one molecule of substrate is linked to synthesis of more than one ATP molecule
   b. Substrate reacts to form a product containing a high energy bond
   c. Only mitochondrial reactions participate in ATP formation
   d. High energy intermediate compounds cannot be isolated

81. The scientist who proposed phylogentic tree for living things
   a. Louis Pasteur
   b. Carlo Urbani
   c. Carl Woese
   d. Robert Koch

82. The identification of bacteria by serologic tests is based on the presence of specific antigens.
Which of the following bacterial components is least likely to contain useful antigens?
   a. Capsule
   b. Ribosomes
   c. Flagella
   d. Cell wall

83. The product of Single cell protein is
   a. biomass obtained during cultivation
   b. secreted extracellular proteins
   c. extraction of intracellular protein
   d. fermentation of waste products

84. In which of the following phase are secondary metabolites produced during microbial growth?
   a. lag phase
   b. exponential phase
   c. stationary phase
   d. death phase

85. The ability of *Vibrio fischeri* to produce bioluminescence chemicals only when the population density reaches a particular level is called
   a. Liebig's law of minimum
   b. Heisenberg's law of uncertainity
   c. Quorum sensing
   d. Law of tolerance

86. Which of the following is NOT considered as a host in rDNA technology (R-Restriction system; M-Modification system)?
   a. R+/M+
   b. R–/M–
   c. R–/M+
   d. R+/M–

87. Which of the following overcomes the problem associated with single enzyme digestion based cloning?
   a. Alkaline phosphatase treatment
   b. Terminal transferase treatment
   c. Polynucleotide kinase treatment
   d. Double digestion based cloning

88. Two different restriction enzymes which recognize different sequences but creates complementary ends are called
   a. Isoschizomers
   b. Neoschizomers
   c. Compatible enzymes
   d. Star activity

89. DNA molecule with 3'-overhangs is converted into blunt end by
   a. DNA polymerase
   b. 3'-5' endonuclease
   c. 5'-3' exonuclease
   d. DNA ligase

90. Which of the following is common to single digestion based cloning, homopolymer mediated cloning and TA cloning?
   a. Self-ligation
   b. Orientation problem
   c. Intermolecular ligation
   d. Intramolecular ligation

91. Which one of the following primers will have low Tm value?
   a. High G:C
   b. Low A:T
   c. Degenerate primers
   d. High A:T

92. In Touchdown PCR, the annealing temperature is
   a. Steadily decreased
   b. Steadily increased
   c. Equal to Tm
   d. Constant

93. Chain termination method of DNA sequencing is due to the incorporation of
a. 5' and 3'-ddNTP
b. 2' and 3'-ddNTP
c. 3'-ddNTP
d. 2'-ddNTP

94. Which of the following is NOT relevant in preparing template for Sanger's sequencing?
a. M13 vector
b. LATE-PCR
c. Asymmetric PCR
d. Assembly PCR

95. SYBR green based real-time PCR is advantageous than end-point PCR because
a. Both exponential and saturation phase can be identified
b. Multiplexing is possible
c. Non-specific amplification are excluded
d. Cost effectiveness

96. The immunologic stimulant of MF59 adjuvant contains
a. Virosomes
b. Monophosphoryl lipid A
c. Squalene
d. Alum

97. The viral vaccine vectors which is a safe choice for retrovirus disease like HIV is
a. pVAX vector
b. Canarypox vector
c. Adenovirus 5 vector
d. ONYX-015 vector

98. Aldesleukin is a recombinant cytokine used for cancer therapy that belongs to
a. IL6
b. IL2
c. TNF alpha
d. IFN gamma

99. The Salk Vaccine is an example for
a. Inactivated viral vaccine
b. Attenuated Viral vaccine
c. Live viral vaccine
d. Engineered viral vaccine

100. The cytokine that causes naïve CD4+ cells to differentiate as T-regs
a. TGF beta
b. TNF alpha
c. IL-17
d. VEGF-D

101. The protein receptor that functions as an immune checkpoint for down-regulating immune responses.
a. CD86
b. CD28
c. CD80
d. CD152

102. ABO-incompatible (ABOi) transplantation of grafts is possible for receipts with
a. no production of isohemagglutinins below one year of age
b. no production of isohemagglutinins above one year of age
c. production of isohemagglutinins below one year of age
d. production of isohemagglutinins above one year of age

103. In humans the principal isotype in secretions and predominantly in the mucus epithelium of the intestinal and respiratory tracts.
a. IgE
b. IgA
c. IgG
d. IgD

104. The alternative pathway C3 convertase is
a. C3bBbD
b. C4b2b
c. C3bBbP
d. C3bBb

105. The IgG transport protein in the placenta that selectively transports IgG from mother to fetus is
a. Fc-epsilonR
b. Fc-alphaR
c. Fc-gammaR
d. Fc-Rn

106. An algorithm which works only on sorted set of element is known as
   a. Exhaustive search algorithm
   b. Selection sort algorithm
   c. Binary search algorithm
   d. Quick sort algorithm

107. Prediction of protein structures based on sequence homology with known structures is known as
   a. Hidden Markov Model
   b. Molecular Modeling
   c. Homology Modeling
   d. Heterology Modeling

108. Which one of the following is NOT a Phylogenetic tree software?
   a. PHYLIP
   b. GROMACS
   c. PAUP
   d. MEGA

109. A connecting point in a phylogenetic tree where two adjacent branches join is called as
   a. Node
   b. Point
   c. Joint
   d. Dot

110. Percent Accepted Mutation Matrices are used for
   a. Docking of protein-ligand complex
   b. Databases generation
   c. Sequence alignment
   d. Molecular simulation

111. BLOSUM62 substitution matrix is used for scoring
   a. Docking molecules
   b. Protein sequence alignments
   c. Molecular simulation of proteins
   d. Searching of proteins

112. Which one of the following statement is NOT TRUE? Basic Local Alignment Search Tool is
   a. Sequence similarity search program
   b. Used to compare query sequence to database of sequences
   c. Tool which provides statistical information and significance about an alignment
   d. Tool used to search for a sequence in biological databases

113. Which one of the following statement is NOT TRUE? Hidden Markov Model is
   a. Statistical model that considers all possible combinations of matches, mismatches and gaps to generate an alignment of a set of sequences
   b. Used to analyze sequence composition and patterns
   c. Used to produce protein structure predictions
   d. Used to generate trajectories of a biomolecule

114. Which one of the following statement is NOT TRUE? An evolutionary tree is
   a. Always a binary tree
   b. Composed of outer branches representing taxa
   c. Composed of nodes and branches representing relationships among taxa
   d. Which has more than one branch emanating from a node if the event separating taxa are so close

115. Needleman-Wunsch algorithm is used for
   a. Local alignment of sequences
   b. Searching of sequences
   c. Minimal alignment of sequences
   d. Global alignment of sequences

PART III

11 - BIO-MEDICAL ENGINEERING

(Answer ALL questions)

56. Longest Cell in human body
   a. Leg muscle cell
   b. Nerve cell
   c. Bone cell
   d. Heart muscle cell

57. Match the following and choose the correct option.

Type Synovial Joint		Bone Involved
A.	Ball and socket	1. Carpal and metacarpal of thumb
B.	Hinge	2. Atlas and axis
C.	Pivot	3. Frontal and parietal
D.	Saddle	4. Knee
		5. Humerus and pectoral girdle

   a. A - 1, B - 3, C - 4, D - 5
   b. A - 1, B - 2, C - 5, D - 4
   c. A - 5, B - 4, C - 2, D - 1
   d. A - 5, B - 4, C - 3, D - 1

58. An action potential in the nerve fibre is produced when positive and negative charges on outside and the inside of the axon membrane are reversed because
   a. all potassium ions leave the axon
   b. more potassium ions enter the axon as compared to sodium ions leaving it
   c. all sodium ions enter the axon
   d. more sodium ions enter the axon as compared to potassium ions leaving it

59. The difference between systolic and diastolic pressure in human is
   a. 40 mm Hg
   b. 120 mm Hg
   c. 60 mm Hg
   d. 80 mm Hg

60. The polysaccharide found in the exoskeleton of insects is _____.
   a. Hylauronic acid
   b. Cellulose
   c. Chitin
   d. Chondrosamine

61. Which of the following vitamin is required for the synthesis of a cofactor required for the conversion of malate to OAA?
   a. Thiamine
   b. Pantothenic acid
   c. Niacin
   d. Riboflavin

62. Abundance of which of the following inhibits beta oxidation of fatty acids?
   a. ATP
   b. Malonyl coA
   c. Citrate
   d. Acetyl coA.

63. What is the outcome of the accumulation of acetyl-CoA in the mitochondria of the liver?
   a. It is used as an energy source
   b. It has broken down into free fatty acids
   c. It gets converted to oxaloacetate
   d. It forms ketone bodies

64. A load is connected to a network. At the terminals to which the load is connected, R_{th} =10 Ω and V_{th} = 40V. The maximum possible power supplied to the load is
   a. 160 W
   b. 80 W
   c. 40 W
   d. 1 W

65. In the circuit given in Fig. Q. 1, the current I through the 10 Ω resistor is

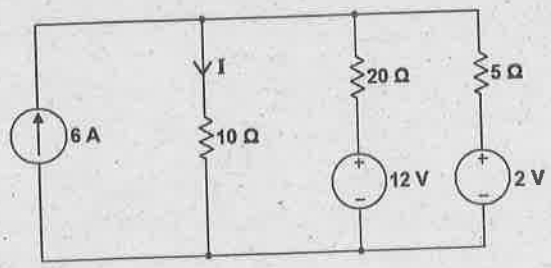


Fig. Q.1

   a. 1.5 A
   b. 3.0 A
   c. 2.5 A
   d. 2.0 A

66. In a parallel RLC circuit with R = 5k Ω, L = 0.5 mH and C = 5 μF, the Quality factor Q is

a. 1000
b. 200
c. 500
d. 2000

67. The switch in the circuit shown in Fig Q. 2 has been closed for a long time, and it is opened at t = 0. The voltage across the capacitor $v_c(t)$ for $t \geq 0$ is given by

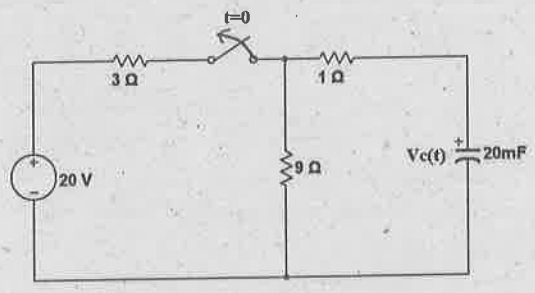


Fig. Q. 2

a. $v_c(t) = 15e^{-t}$ V
b. $v_c(t) = 12e^{-0.2t}$ V
c. $v_c(t) = 15e^{-5t}$ V
d. $v_c(t) = 12e^{-5t}$ V

68. Find the drain current of a JFET with $I_{DSS} = 40$ mA, $V_p = -10$ V and $V_{GS} = -5$ V

a. 10 mA
b. 80 mA
c. 1 mA
d. 8 mA

69. In the Colpitts oscillator C_1 = 100 pF and C_2 = 500 pF, find the minimum gain to sustain oscillation.

a. 5
b. 0.5
c. 0.2
d. 2

70. For the amplifier shown in Fig. 3, Assume V_{BE} = 0.7 V and the transistor parameter α = 1, the voltages vc1 and vc2 in the circuit are

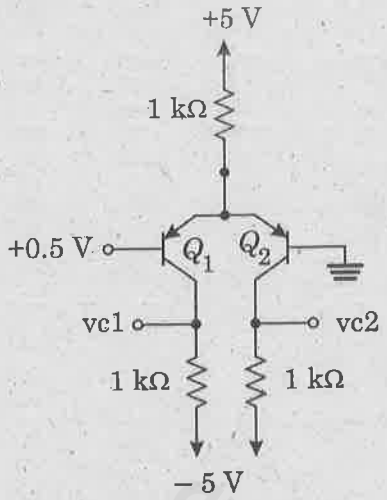


Fig. 3

a. –5 V, –4.3 V
b. 4.3 V, 0.7 V
c. –5 V, –0.7 V
d. –2.9 V, –2.9 V

71. For the amplifier configuration shown in Fig Q. 4, the voltage gain is given by

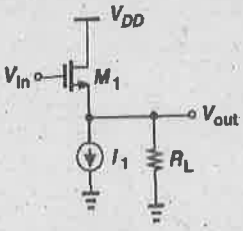


Fig. Q. 4

a. $g_{m1}R_L$
b. $g_{m1}(RL \| ro1)$
c. $\dfrac{R_L}{R_L + \dfrac{1}{g_{m1}}}$
d. $\dfrac{R_L}{ro1}$

72. The minterms in F(A,B,C,D) realized by an 8-to-1 MUX with A,B,C as selection lines and inputs equal to I_0=D, I_1=D', I_2=D, I_3=1, I_4=D', I_5=D', I_6=1, I_7=D are

a. F(A,B,C,D)=Σ(1,2,3,4,5,7,9,11,13,15)
b. F(A,B,C,D)=Σ(1,2,5,6,7,8,10,12,13,15)
c. F(A,B,C,D)=Σ(0,1,2,5,6,7,8,10,12,14)
d. F(A,B,C,D)= Σ(1,2,5,6,8,10,12,13,14,15)

73. A synchronous counter consists of three D FFs namely, D_A, D_B, Dc with outputs Q_A, Q_B, Qc respectively. The connections are as $D_A = Q_C'$, $D_B = Q_A$, $D_C = Q_B$. With the present state given as $[Q_A(t), Q_B(t), Q_C(t)] = [1,0,0]$, the next state $[Q_A(t+1), Q_B(t+1), Q_C(t+1)]$ is
a. 0,1,1
b. 1,0,1
c. 0,1,0
d. 1,1,0

74. Given the gray code number as 10101111, the binary equivalent is
a. 11001010
b. 10100101
c. 10110011
d. 10001111

75. The maxterms corresponding to $F(x,y,z) = xy + x'z$ are
a. $\pi(1,3,5,6)$
b. $\pi(1,2,5,7)$
c. $\pi(0,2,4,5)$
d. $\pi(0,3,4,7)$

76. If the feedback/input resistor ratio of a feedback amplifier is 4.6 with 1.7 V applied to the non-inverting input, find the output voltage.
a. 7.82 V
b. 9.52 V
c. 6.3 V
d. 6.12 V

77. An 8-bit successive approximation analog to digital converter has full scale reading of 2.55 V and its conversion time for an analog input of 1 V is 20 μs. The conversion time for a 2 V input will be
a. 10 μs
b. 20 μs
c. 40 μs
d. 50 μs

78. A 10-bit D/A converter given a maximum output of 10.23 V. The resolution is
a. 10 mV
b. 20 mV
c. 15 mV
d. 25 mV

79. A voltage regulator has a no-load output of 18 V and a full-load output of 17.3 V. The percent load regulation is
a. 0.25 %
b. 96.1 %
c. 4.05 %
d. 1.04 %

80. The _____ is a Programmable Interrupt Controller (IC) specifically designed for use with the interrupt signals (INTR /INT) of the 8085 microprocessor.
a. 8255
b. 8237
c. 8251
d. 8259

81. The memory address of the last location of an 8K byte memory chip is FFFFH. Find the starting address.
a. 9000H
b. D000H
c. E000H
d. A000H

82. The non maskable interrupt in 8085 microprocessor is
a. RST 7.5
b. INTR
c. TRAP
d. RST 6.5

83. What is the maximum addressing capability of a processor if it has 20 bit address line?
a. 20 KB
b. 1 MB
c. 64 KB
d. 160 KB

84. A 500 Hz sinusoidal signal is sampled at 600 samples/ second and a continuous time signal is derived by passing the samples through an ideal low pass filter with cut off frequency of 400 Hz. The signal at the output of the low pass filter will have the tone(s) of
a. 500 Hz
b. 500 Hz and 400 Hz
c. 100 Hz
d. 400 Hz

85. A continuous system has transfer function $H(s) = (1+s)/(1-s)$ and it has right sided RoC. Then, the system is
a. causal and stable
b. causal and unstable
c. non-causal and stable
d. non-causal and unstable

86. A discrete time signal $x(n)$ has its Z-transform $X(z) = 1/(1-2z^{-1})$, $|z| > 2$. Let $X(e^{j\omega})$ represents the discrete time Fourier transform of $x(t)$. Then,
a. $X(e^{j\omega}) = 1/(1-2e^{-j\omega})$
b. $X(e^{j\omega}) = 1/(1-2e^{j\omega})$
c. $X(e^{j\omega}) = (1-2e^{-j\omega})$
d. $X(e^{j\omega})$ does not exist

87. Let N-point of $X(k)$, $k = 0,1,2,..,(N-1)$ represents discrete Fourier transform of a discrete time signal $x(n) = 5\cos(\pi n/8)$. If N equals 32, $X(k)$ will get non-zero components for the value of k equal(s),
a. 8
b. 4 and 28
c. 2 and 30
d. 32

88. An analog filter with system function $H(s) = \dfrac{s+1}{s^2+5s+1}$ is transformed into a digital filter $H(z)$ using impulse invariance technique with $T = 0.1$. The transfer function of corresponding digital filter $H(z)$ is given as
a. $\dfrac{2}{1-e^{-3T}z^{-1}} - \dfrac{1}{1-e^{-2T}z^{-1}}$
b. $\dfrac{2}{1-e^{-2T}z^{-1}} - \dfrac{1}{1-e^{-3T}z^{-1}}$
c. $\dfrac{2}{1-e^{+2T}z^{-1}} - \dfrac{1}{1-e^{+3T}z^{-1}}$
d. $\dfrac{2}{1-e^{+3T}z^{-1}} - \dfrac{1}{1-e^{+2T}z^{-1}}$

89. Blackman window can eliminate ripple in FIR filters with a trade-off
a. smaller transition bandwidth
b. larger transition bandwidth
c. non-linear phase response
d. less pass-band ripple

90. For the same specifications, the order of a Chebyshev filter is _____ that of a Butterworth filter
a. more than
b. equal to
c. less than
d. less than or equal to

91. The filter coefficients of a 5-tap linear phase FIR band reject filter are $h(0) = 0.9$, $h(1) = 0.008$ and $h(2) = 0.007$. The corresponding transfer function is given by
a. $H(z) = 0.9 + 0.008z^{-1} + 0.007z^{-2} + 0.007z^{-3} + 0.008z^{-4} + 0.9z^{-5}$
b. $H(z) = 0.9 + 0.008z^{-1} + 0.007z^{-2} + 0.007z^{-3} + 0.008z^{-4}$
c. $H(z) = 0.007 + 0.008z^{-1} + 0.9z^{-2} + 0.9z^{-3} + 0.008z^{-4} + 0.007z^{-5}$
d. $H(z) = 0.007 + 0.008z^{-1} + 0.9z^{-2} + 0.008z^{-3} + 0.007z^{-4}$

92. Consider a system represented by the block diagram in Fig Q.5

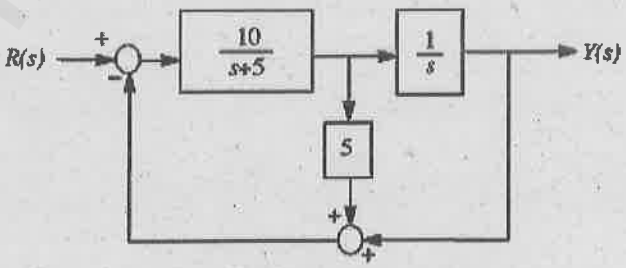


Fig. Q.5

The closed-loop transfer function $T(s) = Y(s)/R(s)$ is
a. $T(s) = \dfrac{10}{s^2+50s+55}$
b. $T(s) = \dfrac{10}{s^2+55s+55}$
c. $T(s) = \dfrac{10}{s^2+50s+50}$
d. $T(s) = \dfrac{10}{s^2+10s+55}$

93. The first two rows in the Routh table for the characteristic equation of a certain closed-loop control system are given as

s^3	1	$(2k+3)$
s^2	$2K$	4

The range of 'K' for which the system is stable is

a. $-2.0 < K < 0.5$
b. $0 < K < 0.5$
c. $0 < K < \infty$
d. $0.5 < K < \infty$

94. Which of the following is the best method for determining the stability and transient response?

a. Root locus
b. Bode plot
c. Nyquist plot
d. None of the above

95. The open loop transfer function for unity feedback system is given by $\frac{5(1+0.1s)}{s(1+5s)(1+20s)}$

Find the steady state error for a ramp input of magnitude 10.

a. 0
b. 2
c. 5
d. Infinite

96. The percentage of the total power carried by the sidebands of the AM when the modulation index is 0.5 is

a. 22
b. 11
c. 33
d. 44

97. The maximum entropy of a discrete memoryless source which generates 8 symbols

a. 2 bits/symbol
b. 1 bit/symbol
c. 3 bits/symbol
d. 4 bits/symbol

98. A signal bandlimited to 3 kHz is sampled at a rate 33.33% higher than the Nyquist rate and is quantized by 256 level quantizer, the data rate of the encoded information in bits/sec

a. 32000
b. 64000
c. 16000
d. 128000

99. Message signal $m(t) = \cos 4000\pi t$ modulates the carrier $c(t) = \cos 2\pi ft$ where f = 1 MHz to produce an AM signal. For demodulating the generated AM signal using an envelope detector, the time constant RC of the detector circuit should satisfy

a. 0.5 ms < RC < 1 ms
b. 1 μs << RC < 0.5 ms
c. RC << μs
d. RC >> 0.5

100. In an ECG amplifier, the right leg driven circuit is used to increase

a. CMRR
b. Gain
c. Input impedance
d. Isolation

101. A transducer has a sensitivity of 10 μv/V/g. Find the output voltage for an applied force of 15 g if the excitation potential is 5 V d.c.

a. 300 μv
b. 750 μv
c. 30 μv
d. 75 μv

102. The mean velocity of the blood flow in the aorta which is about 10.5 mm is 40 cm/sec. The ultrasonic velocity in the blood is 1550 m/sec. What is the Doppler shift in frequency for an ultrasound of frequency of 3 MHz?

a. 1550 Hz
b. 1000 Hz
c. 500 Hz
d. 2000 Hz

103. Among the following electrodes, which has high input impedance?

a. Surface electrode
b. Micro electrode
c. Needle electrode
d. Disc electrode

104. The output energy level of an external pacemaker is
   a. 10 μJ
   b. 100 μJ
   c. 400 μJ
   d. 200 μJ

105. The volume of blood within the dialyzer is known as _____
   a. secondary volume
   b. quarterly volume
   c. priming volume
   d. residual volume

106. The let go current range is
   a. 1-5 mA
   b. 10-50 mA
   c. 100-300 mA
   d. 0-1 mA

107. What is the normal operating frequency of surgical diathermy?
   a. 10 KHz – 20 KHz
   b. 1-3 MHz
   c. 500 Hz
   d. 50 Hz

108. Young's modulus for bone is 1.0×10^{10} N/m^2, find the compression experienced by a leg bone 50 cm long subjected to a load of half the weight of a 70 kg person. The cross-sectional area of a leg bone is about 5 cm^2.
   a. 3.4×10^{-8} m
   b. 3.4×10^{-5} m
   c. 1.4×10^{-5} m
   d. 1.4×10^{-8} m

109. A small artery has a length of 1.1×10^{-3} m and a radius of 2.5×10^{-5} m. If the pressure drop across the artery is 1.3 kPa, what is the flow rate through the artery? (Assume that the viscosity is 3Pa.sec).
   a. 6.04×10^{-14} m^3/sec
   b. 9×10^{-11} m^3/sec
   c. 1.59×10^{-15} m^3/sec
   d. 2.64×10^{-10} m^3/sec

110. Bone is strongest along long axis because
   a. Bone is stronger in resisting both compression and tension
   b. Bone is stronger in resisting tension than in resisting compression
   c. Bone is stronger in resisting compression than in resisting tension
   d. Bone is stronger in resisting tension only

111. Joints that have bones with articulating surfaces that are flat or slightly curved faces and allow for gliding movements
   a. Saddle joints
   b. Condyloid joints
   c. Hinge joints
   d. Planar joints

112. A Radon transformed image $g(l,\theta)$ with l and θ as rectilinear co-ordinates is called
   a. Spectrogram
   b. Sinogram
   c. Scalogram
   d. Sonogram

113. A sample has a T1 of 1.0 seconds. If the net magnetization is set equal to zero, how long will it take for the net magnetization to recover to 98% of its equilibrium value?
   a. 2.8 s
   b. 3.9 s
   c. 8.2 s
   d. 9.3 s

114. The use of Al filter in the X-ray imaging system is
   a. To remove the scattered radiation
   b. To reduce the other radiation
   c. To remove the soft X-rays
   d. To reduce the noises

115. The Technetium-99m has a half-life of _____ and gamma ray energy of _____
   a. 8 hours and 120 KeV
   b. 6 hours and 140 KeV
   c. 6 hours and 120 KeV
   d. 8 hours and 140 KeV

PART III

12 – CHEMICAL ENGINEERING

(Answer ALL questions)

56. A suspension of uniform particles in water at a concentration of 500 kg of solids per cubic meter of slurry is settling in a tank. Density of the particles is 2500 kg/m^3 and terminal velocity of a single particle is 20 cm/s. What will be the settling velocity of suspension? Richardson and Zaki index is 4.6.

a. 20 cm/s,
b. 14.3 cm/s,
c. 7.16 cm/s,
d. 3.58 cm/s,

57. Bed pressure drop in an air fluidized bed of catalyst particles (P = 2000 kg/m^3, Dp = 0.05 cm) of 60 cm bed depth and bed porosity of 0.5 expressed in cm of water (manometer) is

a. 90
b. 60
c. 45
d. 30

58. A pitot tube indicates 5 cm of water (manometer) when it is being used for measuring velocity of air. The velocity of air in m/s is –

a. 5
b. 14.1
c. 56.22
d. 28.2

59. Tooth paste is an example of ———— fluid.

a. Newtonian
b. Power law
c. Bingham plastic
d. Pseudo plastic

60. For the fluid (ρ=780 Kg/m^3; μ=10 Kg/ms) rotating at 60 rpm in 2 m diameter cylinder, the Reynolds number is ————

a. 9360
b. 156
c. 312
d. Data insufficient

61. The area of opening in any one screen in the series is exactly ————that of opening in the next smaller screen.

a. equal to
b. twice
c. Thrice
d. 4 times

62. The sphericity of a cylinder of 1 mm diameter and length 3 mm is :

a. 0.9
b. 0.79
c. 0.6
d. 0.5

63. Size reduction does not occur due to compression in

a. rod mills
b. gyratory crushers
c. jaw crushers
d. smooth crushers

64. Flow of filtrate through cake deposited on septum is usually laminar, which equation will you use to calculate the pressure drop for this situation

a. Leva's equation
b. Kozeny-Carman equation
c. Blake-Plummer equation
d. Bernoulli's equation

65. Governing of a turbine means
   a. the head is kept constant under all conditions of working
   b. the speed is kept constant under all conditions
   c. the discharge is kept constant under all conditions
   d. None of the above

66. Calculate the heat to be transferred to a liquid stream of ethanol at its normal boiling point to generate 100 Kg/h of saturated ethanol vapor. (Latent heat of vaporization of ethanol = 843 KJ/Kg).
   a. 23.38 KJ/s
   b. 24 KJ/s
   c. 23.83 KJ/s
   d. data insufficiency

67. Specific gravity on API scale is given by the relation (G = specific gravity at 15.55°C)
   a. API = 200 (G – 1)
   b. API = (141.5/G) – 131.5
   c. API = (140/G) – 130
   d. API = 145 – (145/G)

68. The Theoretical Oxygen demand for a simple reaction is 100 kmol. What is the amount of Nitrogen is flowing along with the Oxygen approximately?
   a. 375 kmol
   b. 400 kmol
   c. 100 kmol
   d. 100 mol

69. What is the Valence for Calcium in Calcium Carbonate ($CaCO_3$)?
   a. 3
   b. 1
   c. $\frac{3}{2}$
   d. 2

70. A mixture of toluene (40%) and benzene (60%) is fed to the Distillation column; recovery of benzene is 20% at the top, find the ratio of flow rate of benzene from Distillate to the bottoms. (Based on 1000 Kg of feed)
   a. 0.6
   b. 0.2
   c. 0.25
   d. 0.4

71. Law of conservation of mass is FALSE for
   a. System involving reaction
   b. Radioactive isotopes
   c. Both (a) and (b)
   d. None of the above

72. Match the technologies in **Group 1** with the entries in **Group 2**:

Group 1		Group 2	
(P)	Urea manufacture	(I)	Micro-encapsulation
(Q)	Coal gasification	(II)	Ultra-low sulphur diesel
(R)	Controlled release of chemicals	(III)	Shale oil
(S)	Deep hydrodesulphurization	(IV)	Prilling tower
		(V)	Gas hydrates
		(VI)	Gas-solid non-catalytic reaction

   a. P - I, Q -V, R -II, S -VI
   b. P -IV, Q -VI, R -I, S -II
   c. P -IV, Q -I, R -III, S -II
   d. P -V, Q -VI, R -IV, S -II

73. Styrene-Butadiene rubber is commercially manufactured by :
   a. Bulk polymerisation,
   b. Suspension polymerisation,
   c. Solution polymerisation,
   d. Emulsion polymerisation

74. Phthalic anhydride is produced by the oxidation of,
   a. Naphthalene
   b. Benzene
   c. Toluene
   d. Aniline

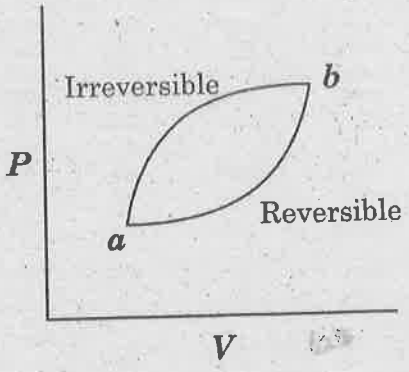
75. In Kraft pulping, fibrous material is cooked in the solution of
   a. sodium hydroxide and sodium carbonate
   b. sodium hydroxide and sodium sulphide
   c. sodium carbonate and sodium sulphate
   d. sodium hydroxide and sodium chloride

76. A heat engine operates at 75% of the maximum possible efficiency. The ratio of the heat source temperature (in kelvin) to the heat sink temperature (in kelvin) is 5/3. The fraction of the heat supplied that is converted to work is
   a. 0.2
   b. 0.3
   c. 0.4
   d. 0.6

77. Air enters an adiabatic compressor at 300 K. the exit temperature for a compression ratio of 3, assuming air to be an ideal gas $(\gamma = C_p / C_v = 7/5)$ and the process to be reversible, is
   a. $300\ (3^{2/7})$
   b. $300\ (3^{3/5})$
   c. $300\ (3^{3/7})$
   d. $300\ (3^{5/7})$

78. For a Carnot refrigerator operating between 40°C and 25°C, the coefficient of performance is
   a. 1
   b. 1.67
   c. 19.88
   d. 39.74

79. For the two paths as shown in the figure, one reversible and one irreversible, to change the state of the system from a to b



   a. ΔU,Q,W are the same
   b. ΔU is the same
   c. Q, W are the same
   d. ΔU , Q are different

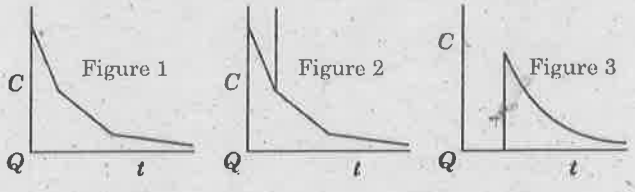
80. Match the following.

Group I	Group II
A. Heat	1. State function
B. Internal energy	2. Path function
C. Work	
D. Entropy	

   a. A-2, B-1, C-1, D-1
   b. A-2, B-1, C-2, D-2
   c. A-2, B-2, C-1, D-1
   d. A-2, B-1, C-2, D-1

81. The gas phase reaction A → B + C is carried out in an ideal PFR achieving 40% conversion of A. The feed has 70 mol% A and 30 mol% inerts. The inlet temperature is 300 K ad the outlet temperature is 400 K. The ratio of the outlet to inlet molar concentration of A (assuming ideal gas mixture and constant pressure) is
   a. 0.60
   b. 0.30
   c. 0.47
   d. 0.35

82. The following figures show the outlet tracer concentration profiles (cvst) for a pulse input.



Match the figures in Group I with the reactor configuration in Group II.

Group I		Group II
P.	Figure 1	I. PFR
Q.	Figure 2	II. CSTR
R.	Figure 3	III. PFR and CSTR in series
		IV. PFR and CSTR in parallel

a. P-II, Q-IV, R-III
b. P-IV, Q-III, R-I
c. P-III, Q-IV, R-II
d. P-I, Q-III, R-II

83. The reaction A → B is conducted in an adiabatic Plug Flow Reactor (PFR). Pure A at a concentration of 2 kmol/m^3 is fed to the reactor at the rate of 0.01 m^3 /s and at a temperature of 500 K. If the exit conversion is 20%, then the exit temperature (in kelvin) is

a. 400
b. 500
c. 600
d. 1000

Given, Heat of reaction at 298 K = −50000 kJ/kmol of A reacted. Heat capacities, $C_{PA} = C_{PB} = 100$ kJ/kmol–K (may be assumed to be independent of temperature).

84. The first order series reaction $A \xrightarrow{k_1} B \xrightarrow{k_2} C$ is in a batch reactor. The initial concentrations of A, B and C (C_{A0}, C_{B0}, C_{C0} respectively) are all non-zero. The variation of C_B with reaction time will not show a maximum, if

a. $k_2 C_B > k_1 C_A$
b. $k_1 C_A > k_2 C_B$
c. $C_{B0} > C_{A0}$
d. $C_{A0} > C_{B0}$

85. A pulse tracer is introduced in an ideal CSTR (with a mean residence time τ) at time = 0. The time taken for the exit concentration of the tracer to reach half of its initial value will be

a. 2τ
b. 0.5τ
c. $\dfrac{\tau}{0.693}$
d. 0.693τ

86. Three solid objects of the same material and of equal masses-a sphere, a cylinder (length = diameter) and a cube are at 500°C initially. These are dropped in a quenching bath containing a large volume of cooling oil each attaining the bath temperature eventually. The time required for 90% change of temperature is smallest for

a. cube
b. cylinder
c. sphere
d. equal for all the three

87. During the transient convective cooling of a solid object, Biot number = 0 indicates

a. uniform temperature throughout the object
b. negligible convection at the surface of the object
c. significant thermal resistance within the object
d. significant temperature gradient within the object

88. For turbulent flow in a tube, the heat transfer coefficient is obtained from the Dittus-Boelter equation. If the tube diameter is halved and the flow rate is doubled, then the heat transfer coefficient will change by a factor of

a. 1
b. 1.74
c. 6.1
d. 37

89. A composite flat wall of a furnace is made of two materials A and B. The thermal conductivity of A is twice of that of material B, while the thickness of layer of A is half of that of B. If the temperatures at the two sides of the wall are 400 K and 1200 K, then the temperature drop (in kelvin) across the layer of material A is

a. 125
b. 133
c. 150
d. 160

90. According to the Fenske Equation what will be the minimum number of plates required in a distillation to separate an equimolar binary mixture of components A and B into an overhead fraction of containing 99 mol% A and a bottom fraction containing 98 mol% B? [Assume that the relative volatile ($\alpha_{AB} = 2$) does not change appreciably in the column].

a. 5
b. 9
c. 12
d. 28

91. If q is defined as a moles of liquid flow in the stripping section of distillation column per moles of feed introduction, then saturated liquid feed

a. $q > 1$
b. $q < 1$
c. $q = 1$
d. $q = 0$

92. For an ideal binary mixture of propane and butane, the mole fraction of propane in vapour phase in equilibrium with a liquid solution containing 50 mol% propane at a pressure of 101.3 kPa are 0.845 and y respectively where

a. $y = 0.845$
b. $y < 0.845$
c. $y > 0.845$
d. $y >= 0.845$

93. For mass transfer of a solute A present in a dilute mixture of A and B, the term PBM tends to

a. total pressure p
b. zero
c. one
d. infinity

94. Which of the following analogies gives $S_t = f/2$?

a. Reynolds analogy
b. Prandtl analogy
c. Chilton-Colburn analogy
d. None of the above

95. For a certain mass transfer process, $k_1 = 1 \times 10^{-3}$ cm/s and $D_{AB} = 1 \times 10^{-5}$ cm^2/s. The film thickness in cm is then

a. 0.1
b. 0.01
c. 0.001
d. more information will be required for calculation of film thickness.

96. An operator was told to control the temperature of a reactor at 60°C. The operator sets the set-point of the temperature controller at 60. The scale actually indicated 0 to 100% of a temperature range of 0 to 200°C. This caused a runaway reaction by over pressurizing the vessel, which resulted in injury to the operator. The actual set-point temperature was

a. 200°C
b. 60°C
c. 120°C
d. 100°C

97. The unit step response of a first order system with time constant τ and steady state gain K_p is given by

a. $K_p (1 - e^{-t/\tau})$
b. $K_p (1 + e^{-t/\tau})$
c. $K_p (1 - e^{-2t/\tau})$
d. $K_p e^{-t/\tau}/\tau)$

98. An example of an open-loop second order under-damped system is
   a. Liquid level in a tank
   b. U-tube manometer
   c. Thermocouple in a thermo-well
   d. Two non-interacting first order system in series

99. Cascade control comes under the control configuration which uses
   a. one measurement and one manipulated variables
   b. more than one measurement and one manipulated variables
   c. one measurement and more than one manipulated variables
   d. more than one measurement and more than one manipulated variables

100. Suppose that the gain, time constant, and dead time of a process with the following transfer function $G_c(s) = 10 \exp(=0.1s)/(0.5s+1)$ are known with a possible error of ±20% of their values. The largest permissible gain K_c of a proportional controller needs to be calculated by taking the values of process gain, time constant and dead time as
   a. 8, 0.6, 0.08
   b. 12, 0.6, 0.12
   c. 8, 0.6, 0.12
   d. 12, 0.4, 0.08

101. The unit step response of the transfer function $2s - 1/(3s + 1)\ (4s + 1)$ reaches its final steady state asymptotically after
   a. a monotonic increases
   b. a monotonic decrease
   c. initially increases and then decrease
   d. initially decrease and then increases

102. The unit step response of the transfer function $1/s^2 + 2.s + 3$
   a. has a non-zero slope at a origin
   b. has a damped oscillatory characteristic
   c. is overdamped
   d. is unstable

103. The characteristic equation for the system is $s^3 + 9s^2 + 26s + 12(2 + K_c) = 0$. Using Route test, the value of K_c that will keep the system on the verge of instability is
   a. 20.9
   b. 18.4
   c. 17.5
   d. 15.3

104. The inverse Lapse transform of $1/2s^2 + 3s + 1$ is
   a. $e^{\frac{-t}{2}} - e^{-t}$
   b. $2e^{\frac{-t}{2}} - e^{-t}$
   c. $e^{-t} - 2e^{\frac{-t}{2}}$
   d. $e^{-t} - e^{\frac{-t}{2}}$

105. The characteristic equation of a closed-loop system using a proportional controller with gain K_c is $12s^3 + 19s^2 + 8s + 1 + K_c = 0$. At the onset of instability, the value of K_c is
   a. 35/3
   b. 10
   c. 25/3
   d. 20/3

106. Elements which are good catalysts and have the ability to change their oxidation number are
   a. transition elements
   b. Nobel gases
   c. alkalis
   d. all of them

107. In Haber process bonds between ammonia and iron surface weaken and break during
   a. adsorption
   b. chemisorptions
   c. both (a) and (b)
   d. desorption

108. Select the incorrect statement from the following option.
   a. Oils are saturated triglyceride
   b. Oils have lower melting points
   c. Oils are liquid at room temperature
   d. Examples of oils are glyceryl trioleate, coconut oil, olive oil, etc

109. Hydrogenolysis is a reaction which leads to the reduction products of _____
   a. Aldehyde
   b. Ketone
   c. Alcohol
   d. Ester

110. Richert-Meissl number is defined as the volume of 0.1 M KOH solution required for the neutralisation of _____ gram/grams of fat or oil.
   a. 1
   b. 5
   c. 100
   d. 1000

111. The loss in cell mass due to oxidation of internal storage products for energy is known as
   a. Oxygen uptake rate
   b. degradation coefficient
   c. synthesis yield coefficient
   d. endogenous decay coefficient

112. Act regulates the use and disposal of biosolids from wastewater treatment plant is
   a. Water Quality Act
   b. Clean Water Act
   c. 40 CFR Part 503
   d. Total maximum daily load section of Clean Water Act

113. Modified Ludzack- Ettinger process is
   a. Post anoxic denitrification
   b. Pre anoxic denitrification
   c. Anoxic denitrification
   d. Anaerobic denitrification

114. Act establishes air emission limits for sludge incinerators
   a. Clean Air Act
   b. 40 CFR Part 60
   c. 40 CFR Part 503
   d. Air Quality Act

115. The works of Pasquill and Gifford states the level of atmospheric stability for Category D is
   a. Slightly stable
   b. Moderately stable
   c. Neutral
   d. Slightly unstable

(Answer ALL questions)

56. Hydrogen like atom has a potential energy of the system as a result of coulombic attraction between the nucleus and electron is, with standard notation

a. $-Ze^2/4\pi\varepsilon_0 r$

b. $Ze^2/4\pi\varepsilon_0 r$

c. $Ze^2/4\pi\varepsilon_0 r^2$

d. $Ze^2/4\pi\varepsilon_0 r^{-1}$

57. An atomic orbital may be generated by

a. Combination of magnetic quantum and spin quantum numbers

b. Combination of azimuthal quantum and spin quantum numbers

c. Combination of magnetic quantum and principal quantum numbers

d. Combination of magnetic quantum and azimuthal quantum numbers

58. The basic property of any state function is represented by (with standard notation)

a. $\Delta E = SE_{final} - SE_{initial}$

b. $\Delta E = \Delta SE_{final} - \Delta S\Delta E_{initial}$

c. $\Delta E = E_{final} - E_{initial}$

d. $\Delta E = \Delta S\Delta E_{final} - \Delta S\Delta E_{initial}$

59. In any thermodynamic process, the internal energy change of the system, for a real gas, with standard notation is

a. $(\delta E/\delta V)_T = 0$

b. $(\delta E/\delta V)_T = -(\delta P/\delta V)_T(\mu C_p + V) - P$

c. $(\delta E/\delta V)_T = -(\delta P/\delta V)_T(\mu C_p - V) - P$

d. $(\delta E/\delta V)_T = -(\delta P/\delta V)_T(\mu C_p + V) + P$

60. In a reversible isothermal isobaric phase change, with standard notations

a. $\Delta E = q + w$

b. $-\Delta E = q + w$

c. $\Delta E = q - w$

d. $\Delta E = w - q$

61. Under isothermal conditions, $\Delta E = 0$ for the expansion of an ideal gas. If 100 J of work is done on the system consisting of 1 mol of an ideal gas, what amount of heat must be transferred?

a. 100 J

b. 100 KJ

c. 10 J

d. 120 J

62. What is the value of S_0^o for Co or NO?

a. 11.526 $JK^{-1}mol^{-1}$

b. 5.763 $JK^{-1}mol^{-1}$

c. 10 $JK^{-1}mol^{-1}$

d. 120 $JK^{-1}mol^{-1}$

63. What is the potential at 25°C of the cell, if $t_+ = 0.837$?

$Pt|H_2(1\,bar)|HCl(0.5M)|HCl(1.0M)|H_2(1\,bar)|Pt$

a. 0.300 V

b. 0.030 V

c. 0.0030 V

d. 0.3330 V

64. What is G-G° for 1.00 mol of an ideal gas at 0.100 Pa and 25°C?

a. –34.20 kJ

b. –3.420 kJ

c. 0.342 kJ

d. 342.0 kJ

65. The number of degrees of freedom with p phases for two component system is

a. 4 + p

b. 3 – p

c. 3 + p

d. 4 – p

66. The blocks of magnesium are often strapped to the steel hulls of ocean going ships in view of
   a. Magnesium acts by cathodic protection to prevent oxidation of steel
   b. Magnesium acts by anodic protection to prevent oxidation of steel
   c. Magnesium acts by cathodic protection to prevent reduction of steel
   d. Steel acts by cathodic protection to prevent reduction of steel

67. A reaction is 50% complete in 10 minutes. It is allowed to proceed for another 5 minutes. How much of the reaction would be completed at the end of these 15 minutes if the reaction follows zero order kinetics?
   a. 50 mol/dm^3
   b. 125 mol/dm^3
   c. 500 mol/dm^3
   d. 250 mol/dm^3

68. Which one of the following is a complex reaction?
   a. $2NO + Cl_2 \rightarrow 2NOCl$
   b. $NO + N_2O_5 \rightarrow 3NO_2$
   c. $2N_2O_5 \rightarrow 4NO_2 + O_2$
   d. $NaOH + HCl \rightarrow NaCl + H_2O$

69. Alkylation of isopropyl benzene by n-butylamine is a
   a. Consecutive reaction
   b. Parallel reaction
   c. Simple reaction
   d. Opposing reaction

70. The rate or rate constant calculated with the help of transition state theory is based on
   a. An equilibrium does not exist between activated complex and reactants
   b. An equilibrium exists between activated complex and products
   c. An equilibrium exists between products and reactants
   d. An equilibrium exists between activated complex and reactants

71. Which of the following statement is correct?
   a. Catalyst initiates a reaction
   b. Catalyst does not initiate the reaction
   c. Catalyst affect the equilibrium
   d. Catalyst is chemically changed at the end of the reaction

72. In retardation the retarding effect is
   a. independent of the pressure of the retarding substance
   b. proportional to the temperature of the retarding substance
   c. indirectly proportional to the pressure of the retarding substance
   d. proportional to a simple power of the pressure of the retarding substance

73. The most effective wavelength used for photochemical reaction between Chlorine and Hydrogen is
   a. less than 4785 Å
   b. between 5000 and 6000 Å
   c. between 6001 and 7000 Å
   d. between 7001 and 8000 Å

74. The extent of adsorption of gas in Langmuir adsorption, when the pressure of gas is low, is
   a. indirectly proportional to the pressure of the gas
   b. directly proportional to the pressure of the gas
   c. independent of Pressure
   d. directly proportional to the square of the pressure of the gas

75. A particular substance will be adsorbed from the solution by a solid adsorbent
   a. if the substance reduces the surface tension of the solvent
   b. if the substance increases the surface tension of the solvent
   c. if the substance does not affect the surface tension of the solvent
   d. if the solvent increases the surface tension of the substance

76. Which of the following hydride is less stable?
   a. MgH_2
   b. CaH_2
   c. BeH_2
   d. SrH_2

77. Which of the following hydride is covalent?
a. MgH_2
b. CaH_2
c. BaH_2
d. SrH_2

78. Which of the following fluoride is water soluble?
a. MgF_2
b. CaF_2
c. BeF_2
d. SrF_2

79. Which of the following element only form nitrides?
a. Mg
b. Ca
c. Be
d. Li

80. Which of the following is an amphoteric oxide?
a. B_2O_3
b. Al_2O_3
c. SiO_2
d. $B(OH)_3$

81. The addition of silicon to steel is to
a. oxidize
b. neutralize
c. deoxidise
d. precipitate

82. The addition of which of the following greatly reduces frothing of cooking oil
a. Silicon
b. Silicones
c. Quartz
d. Silica

83. The number of particles formed from a complex molecule determines
a. the size of depression of freezing point
b. total number of charges obtained from conductivity measurements
c. molecular weight
d. magnetic moment

84. The shape and stability of the complex are predicted by
a. molecular weight
b. the valence
c. density of the metal
d. the atomic orbitals on the metal

85. The crystal field theory is known as Ligand field theory when
a. ion dipole interaction exists
b. ion ion interaction exits
c. some allowance is made for covalency
d. coordinate bonds are formed

86. Which of the following has increased σ donation?
a. halide donors
b. O donors
c. N donors
d. C donors

87. In octehedral complexes the tetragonal distortion forms in
a. z–axis
b. x–axis
c. y–axis
d. x-y–axis

88. Which lanthanide ion is stable in aqueous solution?
a. Ln^{3+}
b. Ln^{4+}
c. Ln^{2+}
d. Ln^{1+}

89. Which salt of lanthanide is soluble in water?
a. Oxalates
b. Carbonates
c. Fluorides
d. Chlorides

90. Which of the following is more reactive?
a. Alkyl magnesium bromide
b. Alkyl magnesium iodide
c. Alkyl magnesium chloride
d. Aryl magnesium bromide

91. Ziegler-Natta catalysts are used to prepare
   a. Cross linked polymer
   b. Graft copolymer
   c. Stereo regular Polymer
   d. Atactic polymer

92. In the Fischer–Tropsch process
   a. Carbon monoxide and hydrogen or water gas is converted into liquid hydrocarbons
   b. Carbon and hydrogen is converted into solid hydrocarbons
   c. Carbon and Nitrogen is converted into liquid hydrocarbons
   d. Carbon monoxide and Nitrogen is converted into liquid hydrocarbons

93. The process of spontaneous decomposition of a heavy nucleus into fragments of lighter nuclei is known as
   a. Nuclear Fusion
   b. Nuclear Fission
   c. Double decomposition
   d. Substitution

94. The Uranium series is represented using standard notation, by
   a. 4n + 3 series
   b. 4n + 1 series
   c. 5n + 2 series
   d. 4n + 2 series

95. A semiconductor behaves as an insulator
   a. at High temperature
   b. at absolute zero
   c. by decreasing the band gap
   d. by adding electrons

96. Which one of the following is optical active?
   a. lactic acid
   b. propionic acid
   c. formic acid
   d. acetic acid

97. Diastereo isomers are
   a. optically inactive isomers and mirror images
   b. optically active isomers and mirror images
   c. optically active isomers but not mirror images
   d. optically inactive isomers and not mirror images

98. Which one of the following undergoes both unimolecular Nucleophillic substitution reaction and bimolecular Nucleophillic substitution?
   a. Tertiary butyl halides
   b. Ethylbromide
   c. Isopropyl chloride
   d. Methylbromide

99. In the addition of bromine to ethylene, under electrophilic addition, the Π complex breaks down into
   a. Carbanion
   b. Carbonium ions
   c. Ethyl radical
   d. Ethane

100. In alkyl benzene, the electron density of Π ring systems increases in
   a. meta position only
   b. ortho and meta position only
   c. para and meta position only
   d. ortho and para position

101. Benzene reacts with chlorine in the presence of Lewis acid to form
   a. chlorobenzene
   b. dichlorobenzene
   c. trichlorobenzene
   d. toluene

102. Addition of three molecules of bromine to benzene in presence of UV light forms
   a. Bromobenzene
   b. Tribromobenzene
   c. Hexabromohexane
   d. Cyclohexane

103. Ethylene reacts with $HgSO_4$ dissolved in H_2SO_4 at 75° yields
   a. Acetaldehyde
   b. Formaldehyde
   c. Acetone
   d. Ethane

104. Which one of the following is electrophiles?
   a. Boron trifluoride
   b. Aluminium chloride
   c. Dichlorocarbene
   d. Diazonium ions

105. Which one of the following undergoes free radical mechanism?
   a. Addition of HCN to acetone
   b. Chlorination of methane in sunlight
   c. Aldol condensation
   d. Nitration of benzene

106. In electrocyclization reactions linear conjugated polyene is converted into a
   a. cyclic product
   b. open chain product
   c. addition product
   d. substitution product

107. In sigmatropic rearrangement
   a. an addition product is formed
   b. cyclic product is formed
   c. a high level of stereochemical control is formed
   d. substitution product is formed

108. Woodward-Hoffman rule
   a. considers the feasibility of a reaction
   b. considers symmetry of Frontier orbitals involved in the reaction
   c. considers lowest energy orbitals
   d. is independent of symmetry of Frontier orbitals involved in the reaction

109. The conversion of ergosterol to vitamin D2 involves
   a. elimination reaction
   b. substitution reaction
   c. adduct reaction
   d. sigmatropic shift

110. In Diels-Alder reaction. When the electron withdrawing groups are present on the alkene
   a. the HOMO/LUMO energy levels are closer
   b. the HOMO/LUMO energy levels are wide
   c. no effect on the HOMO/LUMO energy levels
   d. the reaction not favoured

111. When a mixture of acetylene and ammonia is passed through a red hot tube, it forms
   a. Furan
   b. Pyridine
   c. Pyrrole
   d. Indole

112. Electrophillic substitution reactions of furan are not carried out in the presence of strong acids, because of
   a. polymerization
   b. decomposition
   c. cyclization
   d. degradation

113. The best method of removing thiophene from benzene is
   a. distillation
   b. evaporation
   c. fractional precipitation
   d. shaking with Raney Nickel

114. Indole is
   a. strong acid
   b. strong base
   c. weak base and also weak acid
   d. neutral

115. Dehydrogenation of piperidine with concentrated sulphuric acid at 300°C gives
   a. Isatin
   b. Pyridine
   c. Aniline
   d. Pyrrole

PART III

14 – EARTH SCIENCES

(Answer ALL questions)

56. The Earth plates slider over on?
   a. Lithosphere
   b. Asthenosphere
   c. Biosphere
   d. Mesosphere

57. What is an average rate of increase in temperature with depth in Earth's interior?
   a. 3°/100m
   b. 3.5°/100m
   c. 3.8°/100m
   d. 3.2°/100m

58. What is the term is used for slow, downhill movement of weathered rock?
   a. Diluvium
   b. Rock slide
   c. Soil creep
   d. Mud flow

59. Choose the correct answer for the example of wind produced land form
   a. Mesa
   b. Eskers
   c. Beach
   d. Rock Pedestal

60. Which of the following geological action responsible for development of Chatter marks?
   a. Glacial action
   b. Gully erosion
   c. Wind action
   d. Weathering action

61. How do we designate the title of the science used to describe the landforms produced by exogenous geological agents?
   a. Geodynamics
   b. Geomorphology
   c. Stratigraphy
   d. Remote Sensing

62. V-shaped valley defined as a
   a. steep-walled valleys having narrow depressions and are cut by streams and rivers
   b. steep gorges cut by ocean
   c. steep walls cut by landslide
   d. steep walls formed by drifting of continents

63. Table-topped plateau of comparatively small extent bounded by cliffs and occurring in a region of horizontal strata is described as _____ landform.
   a. Escarpment
   b. Butte
   c. Mesa
   d. Inselberg

64. Name the triangular erosional landform formed between adjacent canyons cut through a hogback.
   a. Gorge
   b. Fletiorn
   c. Deep valley
   d. V-shaped valley

65. Classify the drainage pattern from the following options for a net-work of parallel or subparallel streams developing in strike and dip direction.
   a. Dendritic
   b. Centripetal
   c. Annular
   d. Trellis

66. Brahmaputra and Indus Rivers are the example of _____ streams.
   a. subsequent
   b. insequent
   c. antecedent
   d. consequent

67. Shingle beach composed of
   a. Ill-sorted fragments
   b. Well-rounded cobbles
   c. Sea shell-mat
   d. Assorted pebbles, cobbles and gravels

68. What is the lustre of a Diamond?
   a. Vitreous
   b. Splendent
   c. Adamantine
   d. Dull

69. Uranium mineral is used for generating _____ power.
   a. Nuclear
   b. Wind
   c. Electrical
   d. Solar

70. Name the type of rock, which is derived on the Earth surface by eroded/fragmented from parent rock, transportation by geological agents, deposited and lithified in a basin.
   a. Igneous rocks
   b. Metamorphic rocks
   c. Pyroclastic rocks
   d. Sedimentary rocks

71. _____ texture is a recognition property of a Dolerite rock.
   a. Ophitic
   b. Porphyritic
   c. Poikolitic
   d. Intergrowth

72. Tick the Metamorphic rock from the following options
   a. Basalt
   b. Limestone
   c. Marble
   d. Granite

73. Peninsular India means, surrounded by
   a. The Indian Ocean on the south, the Arabian Sea on the west and the Bay of Bengal on the east.
   b. Deccan traps
   c. Igneous rocks
   d. Eastern and western Ghats

74. Lignite deposit are in
   a. Cuddalore
   b. Neyveli
   c. Panruti
   d. Bhuvanagiri

75. Fossil wood park is in _____ parts of TamilNadu.
   a. Tiruvakarai and Sattanur
   b. Pudukkottai and Kallakurichi
   c. Sivaganga
   d. Karur

76. In which type of fault structure the hanging wall moves down relative to the footwall?
   a. Reverse
   b. Echelon
   c. Normal
   d. Thrust

77. Horizontal axial plane recognises _____ fold structure.
   a. Isoclinal
   b. Recumbent
   c. Anticline
   d. Syncline

78. A fracture, dividing the rock into two sections that moved away from each other called as _____ structure.
   a. Joint
   b. Fold
   c. Fault
   d. Lineament

79. In granitic rock masses, three sets of joints occurs in which one set is horizontal and other two sets are vertical, all three sets being mutually at right angles to each other. Which of the following type of joint is appropriate to the above statement?

a. Bedding joint
b. Oblique joint
c. Sheeting joint
d. Mural joint

80. In which part of the India, we have large deposits of Copper deposits?

a. Khetri
b. Singhbhum
c. Kothakudam
d. Hatti

81. What is the host rock of Salem Magnesite?

a. Limestone and dolomites
b. Quartzite
c. Granite and granodiorites
d. Biotite gneiss and Charnockites

82. Gold is a ———— metal.

a. Heaviest
b. Light
c. Heavy
d. Hardest

83. Which of the following is path finder element of Gold?

a. Cd
b. Pb
c. As
d. Bi

84. Red/ Ruby silver is

a. Pyrargyrite
b. Hussite
c. Argentite
d. Wollastanite

85. Which of the following mineral is referred as Heavy spar?

a. Fluorspar
b. Baryte
c. Cryolite
d. Diatomite

86. Petroleum is ———— natural resource.

a. Inexhaustible
b. Exhaustible
c. Enduring
d. Residual

87. Vermiculate is a variety ———— group of mineral.

a. Quartz
b. Vanadium
c. Feldspar
d. Mica

88. Which of the following is a fibrous mineral?

a. Kyanite
b. Asbestos
c. Talc
d. Gypsum

89. What are Meteorites? Choose the correct answer from the following options

a. Extra-terrestrial material
b. Marine material
c. Terrestrial material
d. Lacustrine material

90. In which of the following rocks Uranium is explored in India?

a. Limestones
b. Shale
c. Conglomerates
d. Granites

91. The amount of a particular element present in the parent rock not affected by dispersion is called as

a. Anomaly
b. Background value
c. Threshold
d. Critical value.

92. How do you present that the water entrapped in the interstices of sedimentary rock?
   a. Meteoric water
   b. Juvenile water
   c. Capillary water
   d. Connate water

93. Storage co-efficient denotes
   a. The yield of an aquifer
   b. Total water budget
   c. TDS
   d. Transmitivity

94. Which of the following formula is used to calculate the Total hardness of the water?
   a. $TH = Ca \times CaCO_3/Ca + Mg \times CaCO_3/Mg$
   b. $TH = Mg \times Ca + CaCO_3/Ca + Mg$
   c. $TH = Mg \times Ca + MgCO_3/Mg + Ca$
   d. $TH = Ca \times MgCO_3 + CaMgCO_3 + Ca$

95. Ghyben-Herzberg equation is used to establish the relation between
   a. Water table and perched water table
   b. Fresh and Saline water
   c. Ground water and surface water
   d. Rain water and connate water

96. HYPERION is a
   a. Satellite sensor
   b. Earthquake detection sensor
   c. GPR
   d. Resistivity image

97. Which of the following field is used by Electromagnetic waves?
   a. Solar field
   b. Polarised field
   c. Electric field
   d. Micro field

98. Which of the following can act as an example for air-borne platform?
   a. LISS-III
   b. MOS
   c. LISS-II
   d. Dakota

99. Polar orbiting satellites are placed at an altitude range of
   a. 7-15 km
   b. 70-150 km
   c. 700-1500 km
   d. 7000-15000 km

100. The acceleration due to gravity, "g" is maximum at
   a. Poles
   b. Tropical regions
   c. Sub-tropical regions
   d. Equator

101. Which of the following is NOT an inverse square law?
   a. Coulomb's law of electrostatics
   b. Hook's law
   c. Newton's law of gravitation
   d. Coulomb's law of magnet statics

102. Which type of seismic waves first arrives first at station from an earthquake hypocentre?
   a. Transverse waves
   b. Raleigh waves
   c. Primary waves
   d. Surface waves

103. The GPS space segments consists of navigation satellite timing and ranging, whose number is
   a. 8
   b. 12
   c. 18
   d. 24

104. How we defines that, the bodies of sea water of considerable volume moving along parallel to the shore?
   a. Littoral currents
   b. Qscillatory waves
   c. Translator waves
   d. Rip currents

105. What type of coral reef that occur from a distance of shore and have flat–topped ridges?

a. Fringing reef
b. Atolls
c. Barrier reef
d. Deposited reef

106. What occurs due to falling of large blocks due to release of stresses during Tunnelling?

a. Rock fall
b. Rock burst
c. Blockage
d. Water gashing

107. When can the rocks act as a natural arch?

a. Tunnel axis parallel to dip direction
b. Tunnel axis normal to dip direction
c. Tunnel axis inclined to dip direction
d. Tunnel axis parallel to strike direction

108. Choose the type of dam usually has a triangular profile and can resist the forces by its own weight

a. Earth Dam
b. Arch Dam
c. Gravity Dam
d. Embankment dam

109. Which of the following is tallest Dam in India?

a. Hirakud Dam
b. Bhakra Dam
c. Krishna raja Sagar Dam
d. Nagarjuna Sagar dam

110. Which of the following is released in large quantities from coal after it is burnt?

a. Sulphur dioxide
b. Nitrogen dioxide
c. Hydrogen
d. Helium

111. Retention pond may be _____ along the stream.

a. Transportation
b. Point bar formation
c. Flood hazards
d. Erosion

112. What ratio of L/D is be used for triaxial test, when the test specimen is in cylinder shape?

a. 1:1.5
b. 1:2.5
c. 1:4
d. 1:1

113. Compressive strength denotes that, the

a. Maximum force expressed per unit area, where the rock can withstand without rupturing
b. Maximum force expressed per unit area, where the rock can withstand after rupturing
c. Maximum force expressed per unit area, where the rock can during rupturing
d. Maximum force expressed per unit area, where the rock can withstand in powdered form

114. El-Nino and La Nino are associated with?

a. Ocean currents
b. Rare climatic events
c. Tsunami
d. Cyclone storms

115. What happens to Plastic waste in sea?

a. It is a biodegradable material, it eventually disintegrates
b. All plastics is recycled by wave action
c. It never fully goes away, it just breaks into little pieces
d. It will be a food to fish

PART III

15 – FOOD TECHNOLOGY

(Answer ALL questions)

Dietary deficiency of selenium leads to

a. Tetany
b. Decreases antioxidant status
c. Inflammation of ligaments
d. Dermatitis

Which of the followings are considered as anti-nutritional factors?

a. Trypsin inhibitor and phytic acid
b. Biotin and Ergosterol
c. Oxalic acid and flavanoids
d. Phytoestrogen and biotin

Ancencephaly and neural tube defects are deficiency manifestation of

a. Pyridoxine
b. Biotin
c. Folic acid
d. Pantothenic acid

Maillard reaction occurs between

a. Carbonyl group of the sugar and carboxyl group of the amino acid
b. Carboxyl group of fatty acid and amino group of the amino acid
c. Alcohol group of the sugar and carboxyl group of the amino acid
d. Carbonyl group of the sugar and amino group of the amino acid

Which one of the following fatty acid is considered as essential fatty acid?

a. Stearic acids
b. Linolenic acid
c. Palmitic acid
d. Lauric acid

61. The ability of the fats to be spread and shaped is termed as

a. Saponification of fats
b. Emulsification of fats
c. Plasticity of fats
d. Gelling of fats

62. Which one of the following is an essential amino acid?

a. Serine
b. Alanine
c. Glutamic acid
d. Phenylalanine

63. Application of pectin in food preparation is

a. Gelling agent
b. Low calorie Sweetener
c. Preservative agent
d. Shortening agent

64. Beneficial effects of food rich in fiber are to

a. Improve for vitamin and mineral absorption
b. Control blood sugar levels and reduces constipation
c. Improve for lipid and mineral absorption
d. Increase cholesterol absorption and reduces blood sugar levels

65. Which one of the following food is a part of dietary recommendation for diabetes?

a. Whole grains
b. Foods rich in simple carbohydrates
c. Highly processed foods
d. Red meat

66. Flavors that are chemically synthesized but chemically and organoleptically identical to substances present in natural products are called as

a. Natural flavoring substances
b. Artificial flavoring substances
c. Synthetic artificial flavoring substances
d. Nature-identical flavoring substances

67. Food having lowest water activity exhibits

a. Decreased shelf life of food
b. More microbial growth
c. Increased shelf life of food
d. Loss of mineral

68. Methylene blue reduction test is done to test the

a. Fat content of milk
b. Sugar content of milk
c. Protein content of milk
d. Bacterial activity of milk

69. GRAS stands for

a. Gross rate Annual savings
b. Generally recognized as safe
c. Gross regulation for analysis and safety
d. General regulation for analysis and safety

70. Which of the following is correct regarding the Ingredients used in the Food product label?

a. Shall be listed in descending order of their composition by weight or volume
b. Shall be listed in ascending order of their composition by weight or volume
c. May be listed as required by the manufacturer
d. Need not be declared

71. JECFA stands for

a. Joint Expert Council on Food Admissions
b. Joint Expert Commission on Food Additives
c. Joint Expert Commerce on Food Additions
d. Joint FAO/WHO Expert Committee on Food Additives

72. Choose from the following with respect to Codex Alimentarius Commission which is right.

a. It is jointly funded by the Food and Agriculture Organisation (FAO) and the World Health Organization (WHO)
b. The Codex Alimentarius covers only processed food
c. It is established in India in 1950
d. It excludes codes of hygienic practice

73. Which of the following is true about Triangle test?

a. Food samples are given, out of which two are identical and the testers are required to pick out the one that is different
b. Food samples are ranked based on a individual attributes of products and they are tested
c. Samples are kept in triangles and further tested
d. Samples are displayed and out of which the identical ones are in triangular position and they are tested

74. Which of the following is determined by performing kjeldahl method?

a. Fat
b. Carbohydrate
c. Protein
d. Ash

Choose from the below what would be the first stage in HACCP system?

a. Putting together a HACCP team
b. In the industry making sure everyone has the appropriate documents
c. Finalizing the product lines and distribution channels that should be included
d. Creating a flow diagram that gives a simple and clear outline of the steps involved in the food process of the company

6. Food business done through E-commerce by default falls under the purview of

a. Central Licensing Authority
b. State Licensing Authority
c. Registration Authority
d. National Certification Authority

7. _____ occurs after ingestion of pathogenic bacteria and/or toxins.

a. Food borne illnesses
b. Food irradiation
c. Food intoxication
d. Food recall

78. Most of the bacteria survive best at

a. Alkaline pH
b. Acidic pH
c. Neutral pH
d. At all conditions

79. _____ is the action or activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

a. Critical control point
b. HACCP
c. Control measure
d. Risk communication

80. Hydrogen peroxide is used as the preservative ion for which of the following food commodity?

a. Milk
b. Meat
c. Confectionery
d. Bread

81. Carboxy methyl cellulose is used as

a. Stabilizer
b. Coloring agent
c. Detergent
d. Emulsifier

82. Nitrate and nitrite is helpful in meat processing as

a. Increase tenderness
b. Increase juiciness
c. Improves color
d. Prevents from microbial deterioration

83. Process of conversion of crude oil to edible oil is known as

a. Purifying
b. Bleaching
c. Refining
d. Filtering

84. Tenderization of meat leads to the

a. Softening of muscles
b. Retaining the color of the meat
c. Prevention from microbial deterioration
d. All of the above

85. Yellow color of cow milk is due to the presence of

a. Carotene
b. Vitamin B
c. Anthocyanin
d. Xanthophyll

86. Methyl salicylate adds which kind of flavor to foods?

a. chocolate
b. orange
c. wintergreen
d. pine apple

87. The addition of folic acid to foods can prevent human from developing

a. heart murmurs
b. skin lesions
c. spina bifida
d. no effect

88. What is added to fruits before freezing commercially to protect quality?

a. Vitamin E
b. Ascorbic acid
c. Water
d. Sugar

89. What nutrient in milk is important for cheese making?

a. water
b. lactose
c. protein
d. fat

90. Which of the following metabolite does not impart flavour to beer?

a. Esters
b. Thiols
c. Carbonyls
d. Alcohols

91. Name the one monosaccharide which occurs naturally in foods or beverages?

a. fructose
b. lecithin
c. beta carotene
d. galactose

92. Reynolds number is the ratio of

a. viscous forces to gravity forces
b. inertial forces to viscous forces
c. viscous forces to inertial forces
d. inertial forces to gravity forces

93. Froude number is the ratio of

a. shear stress to gravitational stress
b. drag stress to shear stress
c. inertial stress to shear stress
d. inertial stress to gravitational stress

94. All of the following is TRUE of thixotropic processes except that they are

a. isothermal
b. brought about by mechanical action
c. of high apparent viscosity
d. reversible

95. The dimension of surface tension is

a. ML^{-2}
b. MT^{-2}
c. MLT^{-2}
d. $ML^{-2}T$

96. In Hagen-Poiseuille flow through a cylindrical tube, the radial profile of shear stress is

a. constant
b. cubic
c. parabolic
d. linear

97. In constant pressure filtration,

a. resistance decreases with time
b. rate of filtration is constant
c. rate of filtration increases with time
d. rate of filtration decreases with time

98. One kilogram of water at 0°C is changed to superheated steam of one atm pressure and 300°C. The major heat consumption in the process will be to

a. heat the water from 0°C to 100 °C
b. evaporate the water
c. to superheat the steam
d. data insufficient, can't be predicted

99. Rubber latex is an example of _____ fluid.

a. Dilatent
b. Newtonion
c. Pseudoplastic
d. Bingham plastic

100. Very small pressure difference (< 5 mm water coloumn) can be most conveniently measured by a/an _____ manometer.

a. U-tube water
b. U-tube mercury
c. inclined tube mercury
d. inclined tube water

101. Isotonic solutions must have the same

a. viscosity
b. molar concentration
c. normality
d. critical temperature

102. A gaseous mixture contains 14 kg of N_2, 16 kg of O_2 and 17 kg of NH_3. The mole fraction of oxygen is

a. 0.16
b. 0.33
c. 0.66
d. 0.47

103. The density of a liquid is 1500 kg/m³. Its value in gm/liter will be equal to

a. 1.5
b. 15
c. 150
d. 1500

104. Which of the following is a primary refrigerant?

a. NaCl
b. H_2O
c. CaCl
d. NH_3

105. In a food industry, break-even point occurs when

a. Annual rate of production equals assigned value
b. Total annual product cost equals total annual sales
c. Total annual profit equals expected value
d. Annual sales equal fixed costs

106. Which of the following is transportation hazard?

a. Stacking
b. Dampness
c. Impact
d. Temperature and RH

107. Gases used in MAP are

a. O_2, SO_2, CO_2
b. O_2, CO_2, N_2
c. CO_2, N_2, NH_3
d. SO_2, NH_3, CO_2

108. Which one of the following is not a membrane separation process?

a. Distillation
b. Reverse Osmosis
c. Electrodialysis
d. Ultrafiltration

109. _____ is considered as heart of refrigeration system.

a. Evaporation
b. Compressor
c. Condenser
d. Expansion valve

110. Which freezer is suitable for liquid food?

a. Scraped surface
b. Plate type
c. Immersion type
d. Air plate type

111. Trickling filters are used for clarification of

a. Syrups
b. Wine
c. Sewage
d. Fruit juices

112. Packaging material should be _____ to retain desirable properties of food products.

a. Transparent
b. Permeable
c. Semi-permeable
d. Impermeable

113. Rigid metal containers are sterilized by using

a. Hot water
b. Superheated steam
c. Hydrogen peroxide
d. Cold air

114. TDT curve is always a

a. Straight line
b. Sigmoid
c. U shaped
d. L shaped

115. Texture profile is measured by using

a. Viscometer
b. GC-MS
c. Textrometer
d. LC-MS

PART III

16 – GEO-INFORMATICS ENGINEERING

(Answer ALL questions)

56. When corrections are applied to the observed length of a line measured between fixed points with a tape that is too long, the correction is

a. added
b. subtracted
c. multiplied
d. divided

57. The line parallel to a central true meridian is called as

a. Magnetic meridian
b. Astronomic meridian
c. Grid meridian
d. Parallel meridian

58. Plotting of the plan and field observation can be done simultaneously in

a. Trigonometric surveying
b. Plane table surveying
c. Plani meter surveying
d. Route surveying

59. Mean sea level is derived by averaging the hourly tide heights over a long period of

a. 1 year
b. 10 years
c. 19 years
d. 27 years

60. The line passing through the intersection of cross hairs of diaphragms and optical centre of the objective in theodolite is called as

a. Line of collimation
b. Trunnion axis
c. Optical axis
d. Horizontal axis

61. If anallactic lens is used in tacheometer, then value of tacheometric constants are

a. 75 and 0.3
b. 75 and 0
c. 100 and 0.3
d. 100 and 0

62. A curve formed by a downgrade followed by a steeper downgrade is

a. Summit curve
b. Valley curve
c. Vertical curve
d. Down curve

63. Establishing theodolite position by Weibach triangle method is practiced for

a. River surveying
b. Tunnel surveying
c. Astronomical surveying
d. Marine surveying

64. The error caused in Total Station when the line of sight is not perpendicular to tilting axis is

a. Vertical axis error
b. Tilting axis error
c. Vertical index error
d. Line of sight error

65. The upper most point on celestial sphere where the plumb line from the observer's station intersects the celestial sphere is called as

a. Zenith
b. Nadir
c. Azimuth
d. Celestial pole

66. Which of the following spectral response combination is useful to observe the chlorophyll fluorescence ?
   a. absorption at 0.4 – 0.5 μm
   b. reflection at 0.5 – 0.6 μm
   c. re-emission at 0.6 – 0.7 μm
   d. backscatter at 1 mm – 1m

67. The coherence between two electromagnetic waves is accomplished
   a. when the phase difference between them is constant in time and frequency
   b. when the phase difference between them is constant in time and space
   c. when both the electromagnetic waves travel in the orthogonal planes.
   d. when both the electromagnetic waves are non-monochromatic

68. Which of the following statement is correct regarding the particle theory?
   a. EM radiation moves in space as magnetic field
   b. EM radiation moves in space as discrete energy packets
   c. EM radiation moves in space as discrete wave packets
   d. EM radiation moves in space as electric field

69. Reflection and Transmission characteristics of a leaf is influenced by ———— in the ———— Spectral regions.
   a. leaf pigments, 0.4 and 0.7 μm
   b. internal mesophyll structure, 0.7 and 1.4 μm
   c. leaf pigments, 0.7 and 1.9 μm
   d. water content, 1.4 and 1.9 μm

70. Pick up the correct statement from the following.
   a. Presence of iron oxide in the soil inversely influences the green reflectance
   b. Presence of iron oxide in the soil directly influence the green reflectance
   c. Presence of iron oxide in the soil produces strong absorption in the NIR reflectance
   d. Presence of iron oxide in the soil produces strong reflectance in the SWIR

71. Atmospheric temperature retrieval is possible with ———— channel from AMSU data.
   a. 54.4 Ghz
   b. 34.3 Ghz
   c. 50.3 Ghz
   d. 31.4 Ghz

72. The altimetry technique used in Sentinnel-3 is ———— in the ———— direction.
   a. Bean and Band limited, across track
   b. Pulse-limited altimetry, along track
   c. Band-limited altimetry, across track
   d. Beam-limited altimetry, along track

73. Hyperspectral sensors work at
   a. Narrow and subset of wavelengths 400 to 1100 nm range
   b. Narrow and subset of wavelengths 8000 nm to 14000 range
   c. Contiguous wavelengths in 400 to 1100 nm range
   d. Contiguous wavelengths in 800 to 1400 nm range

74. Bathymetric LIDAR system make use of the wavelength near
   a. 600 nm
   b. 534 nm
   c. 1000 nm
   d. 1064 nm

75. The discrete-return LIDAR sensors capture the
   a. entire signal trace from discrete objects in the path
   b. heights of major peaks from the objects in the path
   c. time varying intensity of the returned energy from each laser pulse
   d. location of the returned signal in two dimensions

76. Which one is the probabilistic method of image classification?
   a. Minimum distance to mean classifier
   b. Parallelepiped Classifier
   c. Maximum Likelihood classifier
   d. All the above

77. Statistical filters update DN value with
   a. 4-neighbours
   b. 8-neighbours
   c. 7-neighbours
   d. 2-neighbours

78. NDVI Indicates
   a. the healthiness of the vegetation
   b. the water content in the Vegetation
   c. photosynthesis in the vegetation
   d. transpiration of the vegetation

79. The accuracy of classification actually evaluates
   a. The confidential interval in binomial distribution
   b. The accuracy at training stage
   c. The accuracy of kappa value
   d. The accuracy of the classifier Algorithm

80. Histogram equalization increases the
   a. Color variations in the image
   b. The brightness of the image
   c. Color depth of the image
   d. All the above

81. Fourier transform operates in which of the following domain
   a. Chromaticity Plot
   b. Band spectral scatter Plot
   c. Frequency spectrum
   d. Spatial domain

82. Separability of an image class depends on
   a. Image statistics
   b. The difference in spectral property of the image features at a particular band
   c. Number of training sites
   d. All the above

83. One of this can be done without operator's intervention
   a. Thresholding
   b. Clustering
   c. Density Slicing
   d. Contrast Stretch

84. The number of grey values are integer powers of :
   a. 4
   b. 2
   c. 8
   d. 1

85. Which gives a measure of the degree to which a pure colour is diluted by white light?
   a. Saturation
   b. Hue
   c. Intensity
   d. Brightness

86. With a 4.72 in focal length camera the appropriate flying height for an urban project would be
   a. 1800 ft
   b. 9500 ft
   c. 12000 ft
   d. 600 ft

87. Orthographic projection results in
   a. Nominal scale
   b. True scale
   c. Uniform scale
   d. Vertical scale

88. Rotation of camera in x-axis causes scale variation in
   a. x-axis
   b. y-axis
   c. both x and y axes
   d. scale variation

89. Altimetry control points for photogrammetric mapping are to be placed in
   a. Corner points
   b. Clearances
   c. Flat surfaces
   d. Sloping planes

90. Breaklines in a map are the features that explain
   a. Steep slopes
   b. Terrain ruggedness
   c. Sloping grounds
   d. Surface discontinuities

91. In aerial photograph, the scale at a point that has altitude above mean sea level is comparatively
   a. smaller
   b. larger
   c. same a nadir scale
   d. same as average scale

92. One of the advantages of the Photogrammetric mapping is
   a. less error propagation
   b. easy operation
   c. control point extension
   d. cost effective

93. Line and column drop outs in a aerial photo is due to
   a. Atmospheric issues
   b. Scene related issues
   c. Operator mistakes
   d. Sensor relates issues

94. Feathering is an operation employed in
   a. Interior orientation
   b. Orthocorrection
   c. Mosaicking
   d. Radiometric correction

95. The stereoscopic acuity is a measure of
   a. Vertical accuracy
   b. Planimetric accuracy
   c. Control point accuracy
   d. Contour accuracy

96. What does 1 mm on a map drawn at a scale of 1 : 50,000 represent on the ground?
   a. 50 meters
   b. 5 cm
   c. 500 cm
   d. 5 meters

97. Which of the following is not a type of map projection?
   a. Conical
   b. Cyclindrical
   c. Geographic
   d. Zenithal

98. The line joining the points having the same elevation above the datum surface, is called a
   a. Contour Surface
   b. Contour Line
   c. Contour Interval
   d. Contour Gradient

99. The Mercator projection is actually which type of projection?
   a. Conical
   b. Gnomonic
   c. Zenithal
   d. Cyclindrical

100. IRNSS orbital height is
   a. 36,000 km
   b. 20,200 km
   c. 18,000 km
   d. 800 km

101. The aggregation in Generalization is
   a. which groups small features into a higher order class
   b. which joins small features into a larger map element
   c. which decomposes area features to point features
   d. which discards smaller features from among a cluster of features

102. The reference lines on a globe which circle the earth parallel to the equator are lines of
   a. Longitude
   b. Graticule
   c. Latitude
   d. None of the above

103. Maps incorporate many different kinds of symbols. What is the name for the part of a map that explains the meaning of these symbols?
   a. Title Blocks
   b. Legend
   c. Neatlines
   d. Title text

104. The Character which describes the specific variation based on weight, width and angle is called
   a. family
   b. face
   c. font
   d. none of the above

105. In Similarity Transformation
   a. a rotation through an angle
   b. translation
   c. change of scale factor
   d. all the above

106. The two important parameters obtained from remote sensing for operational fisheries forecast are
   a. Upwelling and salinity
   b. SST and amount of chlorophyll
   c. Ocean currents and wind speed
   d. Primary and secondary productivity

107. The scale of _____ is used for preparing national or state level land cover/land use maps
   a. 1 : 1-5 m
   b. 1 : 250000
   c. 1 : 50000
   d. 1 : 25000

108. Which of the following sensor is widely used for study about the Himalayan snow cover?
   a. CARTOSAT
   b. QUICKBIRD
   c. KALPANA
   d. MODIS

109. (Green reflectance – SWIR reflectance)/ (Green reflectance + SWIR reflectance =
   a. NDSI
   b. NDVI
   c. EVI
   d. GARI

110. Identify the method which is not used earlier to compile forest information
   a. Panchromatic
   b. B & W IR
   c. CIR photographs
   d. Visual spotting

111. Waterlogged comes under
   a. Inland natural wetlands
   b. Inland manmade wetlands
   c. Coastal natural wetlands
   d. Coastal manmade wetlands

112. Indian coral reefs are not found in the coast of
   a. Kerala
   b. Maharashtra
   c. Lakshwadweep Islands
   d. Andaman and Nicobar Islands

113. Ocean colour can be monitored using _____ sensor.
   a. LISS
   b. CARTOSAT
   c. AVHRR
   d. SEAWiFs

114. Which one of the following OIR sensor is not used for estimating pre-harvesting production in India?
   a. LANDSAT
   b. MSS/TM
   c. IRS
   d. CARTOSAT

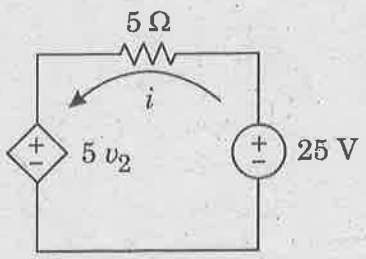
115. Which one of the following crop shows improved crop separability in SWIR ?
   a. Gram
   b. Banana
   c. Sugarcane
   d. Rice

PART III

17 –INSTRUMENTATION, ELECTRONICS AND CONTROL ENGINEERING

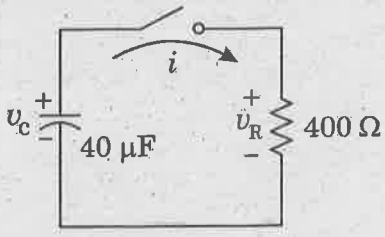
(Answer ALL questions)

56. The current i in the circuit shown when $v_2 = 4V$ is



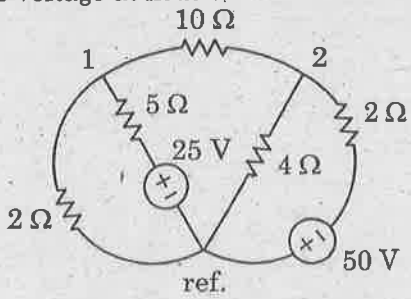
a. 1 A
b. –1 A
c. 9 A
d. – 9 A

57. In the circuit shown at $t = 0^-$ before switch is closed the capacitor voltage is v_c =100V. The current transient for t > 0 is



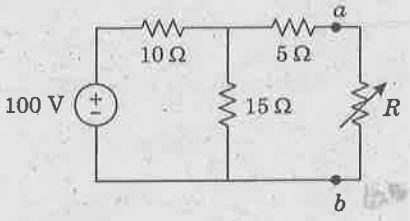
a. $i = 2.5e^{-16t}$
b. $i = 2.5e^{-62.5t}$
c. $i = 0.25e^{-16t}$
d. $i = 0.25e^{-62.5t}$

58. The voltage at node 1 in the circuit shown is



a. 4.96 V
b. 3.23 V
c. 2.61 V
d. 1.42 V

59. The value of variable resistance R in the circuit which results in maximum power transferred to it is

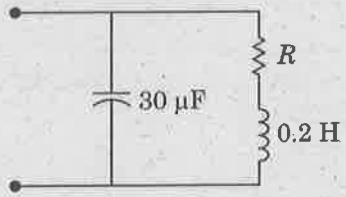


a. 11 Ω
b. 12.5Ω
c. 15 Ω
d. 25 Ω

60. A series RL circuit with R = 10Ω and L = 20 mH has a current of i = 2 sin 500t under steady state. Then the angle by which the current i will lag the source voltage is

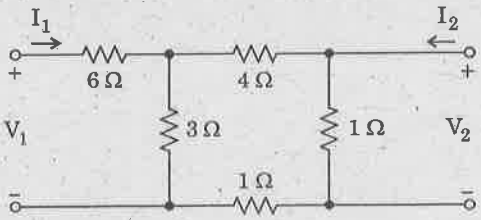
a. 25°
b. 35°
c. 45°
d. 55°

61. The resonant frequency of the circuit shown when R =50 Ω is



a. 65 Hz
b. 60.2 Hz
c. 54.6 Hz
d. 51.4 Hz

62. In the two-port network shown the open circuit input impedance is



a. 0.33 Ω
b. 0.88 Ω
c. 3 Ω
d. 8 Ω

63. The auto-correlation of the sequence {1, 2, 1, 1} is given by
a. {1, 4, 6, 6, 5, 2, 1}
b. {1, 3, 5, 7, 5, 3, 1}
c. {6, 6, 6, 7}
d. (6, 6, 6, 6}

64. Fourier Transform of the sequence $x(n) = 2^n u(n)$ is
a. $1/[1-2e^{-jw}]$
b. $1/[1-e^{-j2w}]$
c. $1/[1+2e^{-jw}]$
d. Fourier Transform does not exist

65. For the signal $e^{j\omega on}$ to be periodic with period N, the condition to be satisfied is (assume m is an integer):
a. $\omega_o = 2\pi m/N$
b. $2\pi\omega_o/N = m$
c. $2\pi/N\omega_o = m$
d. $\omega_o = 2\pi N/m$

66. The System Function of a DT-LTI system is given by $H(z) = 1/[(1-0.5z^{-1})(1-2z^{-1})]$, $|z| > 2$
The system can be characterized as
a. Causal and stable
b. Stable but not causal
c. Causal but not stable
d. Neither causal nor stable

67. For N-point DFT, the speed improvement factor obtained in Radix-2 FFT algorithm over the direct computation is given by
a. $(N/2)\log_2 N$
b. $\log_2 N$
c. $2N/(\log_2 N)$
d. $(\log_2 N)/(2N)$

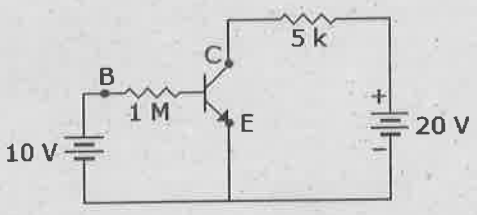
68. Limit Cycle oscillations occur in ——— (i) ——— due to ——— (ii) ———
a. (i) FIR filter (ii) Gibbs Phenomenon
b. (i) FIR filter (ii) Finite Precision arithmetic
c. (i) IIR filter (ii) Gibbs Phenomenon
d. (i) IIR filter (ii) Finite Precision arithmetic

69. When compared to Hanning window, Hamming Window offers?
a. Reduction in main lobe width
b. Increase in main lobe width
c. Better attenuation of side lobe level
d. Poor attenuation of side lobe level

70. For a base current of $10\mu A$, what is the value of collector current in common emitter if $\beta_{dc} = 100$
a. $10\ \mu A$
b. $100\ \mu A$
c. $1\ mA$
d. $10\ mA$

71. In a BJT circuit a pnp transistor is replaced by npn transistor. To analyze the new circuit
a. replace all calculated voltages and currents by reverse values
b. all calculations done earlier have to be repeated
c. replace all calculated voltages by reverse values
d. replace all calculated currents by reverse values

72. In figure, what is the base current if $V_{BE} = 0.7$ V



a. $10\ mA$
b. $9.3\ mA$
c. $10\ \mu A$
d. $9.3\ \mu A$

73. A forward voltage of 10 V is applied to a diode in series with a 1 kΩ load resistor. The voltage across load resistor is zero. It indicates that
a. diode is short circuited
b. diode is open circuited
c. resistor is open circuited
d. diode is neither short circuited nor open circuited

74. A source follower with r_s = source resistance and r_d = drain resistance, has a voltage gain of
a. $g_m r_d$
b. $g_m r_s$
c. $g_m r_s / (1 + g_m r_s)$
d. $g_m r_d / (1 + g_m r_d)$

75. An instrumentation amplifier has a high
a. Output impedance
b. Power gain
c. CMRR
d. Supply voltage

76. When the gate – to – source voltage (V_{GS}) of a MOSFET with a threshold of 400 mV, working in saturation is 900 mV, the drain current is observed to be 1 mA. Neglecting the channel width modulation effect and assuming that the MOSFET is operating at saturation, the drain current for an applied V_{GS} of 1400 mV is
a. 0.5 mA
b. 2.0 mA
c. 3.5 mA
d. 4.0 mA

77. $(A + B \cdot C) \cdot (A + B' + C')$ would simply to
a. A
b. $A + B' + C'$
c. $A + B \cdot C$
d. $A \cdot B \cdot C$

78. Of the logic families mentioned below, the one that consumes the least power is
a. low power TTL
b. low power Schottky TTL
c. CMOS
d. ECL

79. A data selector is also called a
a. De-multiplexer
b. Priority encoder
c. Multiplexer
d. Decoder

80. The minimum number of comparators required to build an eight-bit simultaneous or flash A/D converter is
a. 127
b. 63
c. 8
d. 255

81. The percentage resolution of an n-bit D/A converter can be computed by
a. $[1/(2^n - 1)] \times 100$
b. $n/100$
c. $100/2^n$
d. $(2^{n-1})/100$

82. SHIFT LEFT instruction causes all bits shifted one position to the left with right-most bit set to zero. The effect is to
a. multiply by 2
b. divide by 2
c. SET the most significant bit
d. RESET the most significant bit

83. The processor architecture that uses separate memory for program instructions and data is
a. Von Neumann architecture
b. Pipeline architecture
c. Harvard architecture
d. Princeton architecture

84. A Schering bridge can be used for the measurement of ———
a. Voltage
b. Current
c. Resistance
d. Capacitance

85. The opposite two ends of a Wheatstone bridge consists of ———
a. Voltage and current source
b. e.m.f. and null detector
c. Resistance and capacitance
d. Inductance and impedance

86. Two resistance $R1 = 100 \pm 5\Omega$ and $R2 = 150 \pm 15\Omega$ are connected in series. If the error is specified as standard deviations, the resultant error will be ———
   a. $\pm 10\,\Omega$
   b. $\pm 10.6\,\Omega$
   c. $\pm 15.8\,\Omega$
   d. $\pm 20\,\Omega$

87. A 0–400 V voltmeter has a guaranteed accuracy of 1% of full scale reading. The voltage measured by this instrument is 250 V. Calculate the limiting error in percentage.
   a. 4%
   b. 2%
   c. 2.5%
   d. 1%

88. The power in a 3 phase four wire circuit can be measured by using ———
   a. 2 wattmeter
   b. 4 wattmeter
   c. 3 wattmeter
   d. 1 wattmeter

89. Error in a transducer due to its slow response to input change is called
   a. Gross error
   b. Limit error
   c. Static error
   d. Dynamic error

90. The standardization of AC potentiometer is done by
   a. Using DC standard source and d' Arsonval galvanometer
   b. Using AC standard sources and transfer instruments
   c. Directly using AC standard voltage sources
   d. Using DC standard sources and transfer instruments

91. Thermistor can be preferred over RTD for its
   a. Accuracy and stability
   b. Sensitivity and accuracy
   c. Sensitivity and quick response time
   d. Accuracy, stability and quick response time

92. A potentiometer is used to measure the displacement of a hydraulic ram. The potentiometer is 25 cm long, has a total resistance of 2500 ohms and is operating at 4W with a voltage source. It has linear resistance-displacement characteristics. Determine the sensitivity of the potentiometer in volts/cm
   a. 0.2 V/cm
   b. 2 V/cm
   c. 0.4 V/cm
   d. 4 V/cm

93. The law that governs the working principle of IR thermometer is
   a. Peltier effect
   b. Stephen Boltzmann law
   c. Nernst equation
   d. Beer Lambert's law

94. Which of the flow meter has the lowest pressure loss for a given range of flow?
   a. Orifice meter
   b. Venturi meter
   c. Flow nozzle
   d. Dall tube

95. Which of the following represents relation for kinematic viscosity?
   a. Absolute Viscosity /mass density
   b. Absolute frictional force × mass density
   c. Absolute density × (mass density)^2
   d. Absolute Viscosity /(mass density)^2

96. A d/p cell used to measure liquid level has a "suppressed zero." This means
   a. The transmitter uses filter circuits to suppress noise to a zero level
   b. The liquid is less dense than water
   c. The transmitter is located below the 0% liquid level mark
   d. The elevation of the vessel is below sea level

97. The seismic mass of a spring mass accelerometer is 50g and the spring constant is 5000 N/m. The amplitude of the mass displacement is ±2 cm. The natural frequency of oscillation of the system is about
   a. 50 Hz
   b. 60 Hz
   c. 70 Hz
   d. 80 Hz

98. The pH of a liquid solution is a measure of:
   a. Dissolved salt content
   b. Hydrogen ion activity
   c. Hydroxyl ion molarity
   d. Electrical conductivity

99. A chromatograph separates and distinguishes different molecule types in a fluid stream by:
   a. Emitted light spectra
   b. Atomic mass (weighing)
   c. Electric charge
   d. Adsorption time-delay

100. According to the Nernst equation, the voltage developed by the electrodes will _____ when temperature increases and all other factors remain the same.
   a. Approach zero
   b. Decrease
   c. Fluctuate
   d. Increase

101. NMR is the study of absorption of _____ by nuclei in a magnetic field?
   a. Radioactive radiation
   b. IR radiation
   c. Radio frequency radiation
   d. Microwaves

102. Detectors used in IR spectroscopy
   a. PMT
   b. Electron capture detector
   c. Thermal detectors
   d. Photocell

103. What is a cell constant 'K' in a conductivity meter?
   a. It is equal to the distance in cm between the probe's electrodes divided by the surface area of the electrodes in cm^2
   b. It is equal to the distance in cm between the probe's electrodes
   c. It is equal to the surface area of the electrodes in cm^2 divided by the distance in cm between the probe's electrodes
   d. It is equal to the surface area of the electrodes in cm^2

104. A method for achieving frequency translation is to multiply the modulating signal $f(t)$ with a _____ carrier signal.
   a. Sinusoidal
   b. Ramp
   c. Step
   d. Impulse

105. The bandwidth requirement of the Frequency Division Multiplexing (FDM) is _____ when compared to that of the Time Division Multiplexing (TDM) system.
   a. the same
   b. higher
   c. lower
   d. zero

106. A band limited signal having no frequency components higher than f_m *Hz* is completely described by its sample values at uniform intervals less than or equal to _____ seconds apart.
   a. $2f_m$
   b. $\frac{1}{2f_m}$
   c. $\frac{2f_m}{3}$
   d. $\frac{f_m}{2}$

107. The spectral range of a function extends from 10.0 MHz to 10.2 MHz. Find the minimum sampling rate
   a. 0.5 MHz
   b. 0.2 MHz
   c. 0.4 MHz
   d. 0.6 MHz

108. Compared with the laser, the LED has a, _____
   a. higher output power, slower switching speed and lower spectral width
   b. lower output power, faster switching speed and lower spectral width
   c. higher output power, faster switching speed and lower spectral width
   d. lower output power, slower switching speed and greater spectral width

109. In Ruby laser the atoms are excited by
   a. Optical flash tube
   b. Electron beam
   c. Semi-transparent mirror
   d. Mechanical vibration

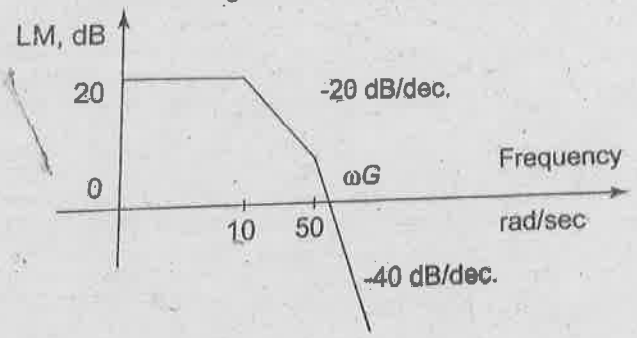
110. The closed loop transfer function of a unity feedback system is given as $\frac{C(s)}{R(s)} = \frac{30}{s^2 + 5s + 36}$.
The steady state error for unit step input is
   a. 0
   b. 0.0277
   c. 0.1667
   d. infinity

111. A state model for a second-order system is $\dot{X} = \begin{bmatrix} 1 & 1 \\ -2 & -1 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$ and $Y = [1 \quad 0]X$.
The system is
   a. state controllable and observable
   b. uncontrollable and observable
   c. state controllable and unobservable
   d. uncontrollable and unobservable

112. Lead compensator is a
   a. Low Pass Filter
   b. High Pass Filter
   c. Band Pass Filter
   d. Band Reject Filter

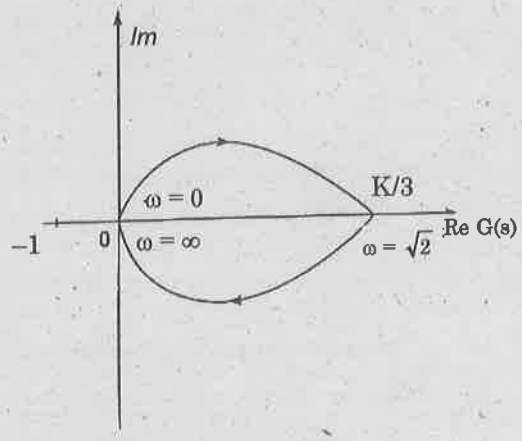
113. The open-loop transfer function of a negative feedback system is $G(s)H(s) = \frac{K}{s(s+1)(s+2)}$.
The critical gain of the system is
   a. 2
   b. 4
   c. 6
   d. 8

114. The transfer function of log magnitude plot shown in Fig. is



   a. $\frac{50}{(s+10)(s+50)}$
   b. $\frac{500}{(s+10)(s+50)}$
   c. $\frac{5000}{(s+10)(s+50)}$
   d. $\frac{500}{s(s+10)(s+50)}$

115. The Nyquist plot of the unity feedback system with open-loop transfer function $G(s) = \frac{Ks}{(s+1)(s+2)}$ is shown in Fig. The closed loop system is



   a. Absolutely stable
   b. Marginally stable
   c. Critically stable
   d. Unstable

PART III

18 – LEATHER TECHNOLOGY

(Answer ALL questions)

56. Which gas is emitted during liming operation?
    a. Ammonia
    b. Hydrogen sulphide
    c. Chlorine
    d. Volatile Organic Compounds

57. Which enzyme is used for unhairing process?
    a. Collagenase
    b. Protease
    c. Lipase
    d. Amylase

58. Which of the following agent is used for bating process?
    a. Alkali
    b. Acid
    c. Enzyme
    d. Salt

59. Which of the following can cause high TDS in liming wastewater is?
    a. Use of Na_2S
    b. Use of lime
    c. Solubilizing hair and use of Na_2S
    d. Residual lime

60. Major issue associated with curing by freezing is
    a. Exorbitant cost
    b. Red heat
    c. Cracking of hides
    d. Transportation

61. If the moisture content in leather is more than adequate during staking, leather becomes
    a. Weak
    b. Loose
    c. Soft
    d. Fluffy

62. Relationship between softness and fluffiness in leather is
    a. None
    b. Directly proportional
    c. Inversely proportional
    d. Directly proportional upto a point

63. Which of the following raw materials has high hair density?
    a. Sheep
    b. Cow
    c. Buff
    d. Goat

64. Fine break is an important property requirement of
    a. Shoe upper leather
    b. Lining leather
    c. Glove leather
    d. Garment leather

65. Which of the following is a major gas produced in aerobic digestion of sludge?
    a. NO_2
    b. CO_2
    c. O_2
    d. H_2S

66. Which process of wastewater treatment is done to avoid floating debris, branches of trees or other large particles suspended in wastewater?
    a. Screening
    b. Aeration
    c. Primary sedimentation
    d. Secondary sedimentation

67. The double layer effect in sheep skin is a result of
   a. Breed variation
   b. Fat pockets
   c. Curing methods
   d. Bad flaying

68. Red Heat is caused by
   a. Halophilic bacteria
   b. Cyano bacteria
   c. Algae
   d. Fungi

69. Among the following which is acidic amino acid?
   a. Aspartic acid
   b. Glycine
   c. Cysteine
   d. Lysine

70. Toggling operation is done to enhance the
   a. Softness
   b. Area yield
   c. Run
   d. Thickness

71. In the analysis of Bating agent, which combination of mixed indicator is used?
   a. Bromocresol green – Methyl orange
   b. Bromothymol blue – Phenol red
   c. Methyl red – Methyl orange
   d. Bromocresol green – Methyl red

72. The indicator used in estimation of Aluminium tanning agents is
   a. Eriochrome Black T
   b. Ethylene Diammine Tetra Acetic acid
   c. Fast Sulphon
   d. Murexide

73. Which of the following is not analyzed in Vegetable tanned leather used for determination of degree of tannage?
   a. Moisture content
   b. Insoluble ash
   c. Total sulphate
   d. Hide substance

74. In microscopy, Gram positive bacterium is stained using which material
   a. Fast green
   b. Haematoxylin
   c. Crystal violet
   d. India ink

75. Rod shaped bacteria are known as
   a. Cocci
   b. Comma forms
   c. Bacilli
   d. Plemorphic forms

76. Which of the following process treatment provides better permeability property of a leather?
   a. Chrome tanning
   b. Post tanning
   c. Aldehyde tanning
   d. Vegetable tanning

77. Addition of cationic fatliquor during chrome tanning is mainly due to
   a. Facilitates Cr penetration
   b. Renders chrome fixation
   c. Retains the moisture in wetblue
   d. Makes the surface smooth

78. Zirconium tanning imparts ——— in leather.
   a. Softness
   b. Fullness
   c. Fluffiness
   d. Smoothness

79. Iron tanned leathers deteriorate rapidly due to
   a. Oxidation
   b. Reduction
   c. Olation
   d. Redox reaction

80. Syntans, dyes and fatliquors bind with collagen predominantly through ——— interactions.
   a. Covalent bond
   b. Coordinate-covalent bond
   c. Ionic bond
   d. Metallic bond

81. Aldehyde tanning results in ——— linkage.
   a. $-NH-CH_2-NH-$
   b. $-NH-CH_2OH$
   c. $-NH-CHO$
   d. $-NH-CO-NH-$

82. Piling of chrome tanned leather helps in
   a. Fixation of Cr
   b. Stripping of unfixed chromium
   c. Improves the color of the leather
   d. Facilitates uniform distribution of chromium

83. What is the functionality of fatliquors?
   a. Lubrication
   b. Cross linking
   c. Swelling
   d. Bleaching

84. Building blocks of triglycerides and phospholipids are called as
   a. Carbohydrates
   b. Proteins
   c. Fatty acids
   d. Amino acids

85. During staining, the smear is heat-fixed in order to
   a. kill the organism so that dyes will penetrate
   b. attach the organism firmly to the slide
   c. kill the organism and attach the organism firmly to the slide
   d. neither kill the organism nor attach the organism firmly to the slide

86. Which is a property of garment leather?
   a. Drape
   b. Hardness
   c. Stiff
   d. Rough

87. Which of the following is a functional property?
   a. Fullness
   b. Roundness
   c. Strength
   d. Firmness

88. Which of the following is a preferred ratio for syntans:fatliquors in garment leather processing?
   a. 1 : 2
   b. 2 : 1
   c. 2 : 0.5
   d. 0.5 : 2

89. Which of the following processes that contributes to high VOC emissions?
   a. Fatliquoring and Finishing
   b. Dyeing and Tanning
   c. Retanning and Dyeing
   d. Bleaching and Neutralization

90. Which type of syntan are mainly prepared by the condensation of urea, thio-urea, dicyandiamide and melamine either as a single amino base or in mixture?
   a. Phenolic Syntan
   b. Amino resin Syntan
   c. Neutralization Syntan
   d. Bleaching Syntan

91. Commercial belly filling syntans are made up of
   a. Melamine
   b. Phenol – Formaldehyde
   c. Vegetable Tannins
   d. Protein

92. Which one of the following is the precursors for phenol-formaldehyde syntan?
   a. Resorcinol
   b. Sulfonyl chloride
   c. Acetone
   d. Ethylene oxide

93. The solid type fatty acids may liberate due to crystallization on the surface of the leather is called as

a. Fatty spue
b. Fatliquor
c. Wetting agent
d. All of them

94. Low refractive index pigments are also called as

a. Extenders
b. Binders
c. Wax
d. Plasticizer

95. Which type of dye aids in achieving perspiration and wash properties in leather?

a. Sulfur dyes
b. Metal complex dyes
c. Mordant dyes
d. Basic dyes

96. Which type of binder has high thermal resistance?

a. Casein
b. Polyurethane
c. Acrylic
d. Butadiene

97. In Leather abrasion test (Martindale), as per SATRA standards the no. of revolutions the leather is tested

a. Dry – 12500 and Wet - 25000
b. Dry – 120000 and Wet - 25000
c. Dry – 2500 and Wet - 25000
d. Dry – 25600 and Wet – 12800

98. What are the minimum recommendations of the Leather in Lastometer test?

a. Load - 20 kg and Distension - 7 mm
b. Load - 7 kg and Distension - 20 mm
c. Load - 40 kg and Distension - 20 mm
d. Load - 20 kg and Distension - 40 mm

99. The key species responsible for high Ts in chrome tanning is

a. $Cr(H_2O)_6$
b. $Cr(OH)(H_2O)_5$
c. $Cr_2(OH)_2(H_2O)_8$
d. $Cr_3(OH)_4(H_2O)_{10}$

100. Chromophores consists of ——— which are responsible for color.

a. Covalent compounds with localized electrons
b. Ionic compounds with localized protons
c. Coordinate compounds with delocalized protons
d. Functional groups with delocalized electrons

101. Ideal cutting area of leather for vamp component is from

a. Shank
b. Shoulder
c. Butt
d. Belly

102. No of stitches per cm for oxford shoe made of goat leather

a. 1-2
b. 2-3
c. 3-4
d. 4-5

103. Bell knife is used

a. In splitting machine
b. In edge setting machine
c. In skiving machine
d. In ink marking machine

104. Hot melts adhesive is

a. Thermoplastic in nature
b. Thermosetting in nature
c. Electrostatic in nature
d. None of the above

105. White patches in the shoe, which get clean with rubbing is due to

a. Fat spew
b. Deposition of moisture
c. Salt spew
d. None of the above

106. Principle of mean forming

a. Conversion of 3D surface of last in 2D form
b. Conversion of 2D leather into 3D shoe shape
c. Calculation of leather requirement for a given style
d. Converting shoe upper in lasting form

107. Length increment in English sizing system is

a. 8.4 mm
b. 8.4 cm
c. 6.0 mm
d. 4.2 mm

108. The distance between the "Nett Feather Line" and "Gross Feather Line" of a digitized shell is the

a. Trimming Allowance
b. Lasting Allowance
c. Folding Allowance
d. Seam Allowance

109. Type of needle one should use to stitch kid leather is

a. PCL
b. LR
c. R
d. D

110. Which of the following are chromophoric groups?

a. $-NH_2, -NHCH_3$
b. $-OH, -OR$
c. $-N=N-, C=O$
d. $-COOH, -SO_3H$

111. Which one of the following is unsaturated fatty acid?

a. Linoleic acid
b. Stearic acid
c. Lauric acid
d. Myristic acid

112. Functionality of sodium bicarbonate and sodium formate is substituted by which class of syntan?

a. Bleaching Syntan
b. Neutralization Syntan
c. Exchange Syntan
d. Selective filling syntan

113. When all the consumers have roughly the same preferences and the market shows no natural segments, then it is called as:

a. Homogeneous preferences
b. Diffused preferences
c. Clustered preferences
d. Weighted preferences

114. According to Hersey and Blanchard's Situational Leadership Theory, in which of the following approaches of leadership, the leader assigns decision making responsibility to team members and oversees their work?

a. Delegating
b. Telling
c. Selling
d. Participating

115. In cemented shoe construction, one should use ——— adhesive for extreme condition of temperature.

a. Single component of PU adhesive
b. Neoprene base adhesive
c. Hot melt adhesive
d. Double component of PU adhesive

PART III

19-MATERIALS SCIENCE & CERAMIC TECHNOLOGY

(Answer ALL questions)

56. The Miller indices are the same for
    a. alternate half indices planes
    b. crystallographic planes
    c. orthogonal planes
    d. parallel planes

57. The converse of magnetostriction effect is
    a. Thompson Effect
    b. Inverse piezo electric effect
    c. Curie effect
    d. Villari effect

58. Which one of the following is not the polymorph of silica?
    a. cristobalite
    b. niobate
    c. tridymite
    d. quartz

59. The electrical conductivity of a conductor may be increased by
    a. increasing its temperature
    b. decreasing its temperature
    c. increasing its vibration
    d. increasing impurity concentration

60. The depletion region in an open circuited p-n junction cotains
    a. electrons
    b. holes
    c. uncovered immovable impurity ions
    d. neutralized impurity atoms

61. The electromechanical effect of polarization is known as
    a. magnetostriction
    b. electrostriction
    c. piezo electricity
    d. inverse piezo electricity

62. Above curie tempertaure the hysteresis loop of a ferroelectric material merges into a
    a. parabola
    b. cycloid
    c. straight line
    d. point

63. In which of the following materials, the magnetization is nonlinearly associated to the applied field
    a. ferro magnetic materials
    b. paramagnetic materials
    c. dia magnetic materials
    d. all of the above

64. For isotropic materials the linear, areal and volume expansion coefficients are in the ratio
    a. 1:2:3
    b. 1:4:9
    c. $1:\sqrt{2}:\sqrt{3}$
    d. 1:1:1

65. An octahedral void is surrounded by
    a. 8 atoms
    b. 18 atoms
    c. 6 atoms
    d. 4 atoms

66. The degrees of freedom for a system having equal number of components and phases will be
    a. 1
    b. 2
    c. 3
    d. 4

67. The reaction that yields two solid phases on cooling a single solid phase is called
    a. Eutectic
    b. Eutectoid
    c. Peritectic
    d. Peritectoid

68. During cooling, the complete transformation of austenite takes place from liquid state
   a. at 723°C
   b. just above 723°C
   c. just below 723°C
   d. none of the above

69. Gibbs phase rule for general system:
   a. $P + F = C + 1$
   b. $P + F = C - 2$
   c. $P + F = C - 1$
   d. $P + F = C + 2$

70. Pearlite phase in steel is made up of
   a. alternate layers of ferrite and cementite
   b. alternate layers of martensite and cementite
   c. alternate layers of ferrite and martensite
   d. alternate layers of bainite and cementite

71. Recrystallization temperature is the temperature at which recrystallization just reaches completion in
   a. 1 hr
   b. 2 hr
   c. 3 hr
   d. 4 hr

72. Which of the following element is added to iron to improve its oxidation resistance?
   a. Copper
   b. Zinc
   c. Magnesium
   d. Chromium

73. Choose the correct statement
   a. Thermoplastics are crystalline
   b. Thermosetting and thermoplastic polymers are essentially amorphous
   c. Thermoplastics are either amorphous or crystalline but thermosets are amorphous
   d. Thermosetting plastics are crystalline

74. For metal-matrix composites the matrix is a
   a. polymer
   b. ceramic
   c. ductile metal
   d. glass

75. Which of the following statement/s is are true for nanoparticles?
   a. Carbon nanotubes are cylindrical fullerenes
   b. Volume to surface area ratio is very large for nanomaterials
   c. Hardness of a single walled nanotube is about 63×10^9 Pa.
   d. The size of a quantum dot is 100 nm

76. Matthiessen's rule relates to
   a. Superconductors
   b. Ferromagnetic materials
   c. Resistivity of impure metals
   d. Diffusion

77. Electronic polarization
   a. Increases with temperature
   b. Decreases with temperature
   c. Independent of temperature
   d. None of the above

78. The sprinkling of water reduces the temperature of the closed room
   a. The water has large latent heat of vaporization
   b. Water is bad conductor of heat
   c. Specific heat of water is high
   d. The temperature of water is less than that of room temperature

79. The main constituent of permalloy is
   a. Cobalt
   b. Chromium
   c. Nickel
   d. Tungsten

80. In a tension specimen the elongation at the time of fracture is

a. localized near the ends
b. localized in the region of necking
c. delocalized in the centre of the length
d. none of the above

81. In the Griffith equation, the fracture stress is proportional to

a. C
b. $2C$
c. $C^{\frac{1}{2}}$
d. $\left(\frac{1}{C}\right)^{\frac{1}{2}}$

82. A type-I superconducting material when placed in a magnetic field will

a. Expel all the magnetic lines of forces passing through it
b. Attract the magnetic field toward its centre
c. Not influence the magnetic field
d. None of the above

83. The temperature below which certain materials are ferromagnetic and above which they are paramagnetic is called

a. Neel temperature
b. Curie temperature
c. Weiss temperature
d. None of these

84. Creep occurs at a temperature above

a. $0.16\ T_m$
b. $0.22\ T_m$
c. $0.4\ T_m$
d. $0.9\ T_m$

85. Fatigue failure occurs due to

a. Extended constant loading
b. Extended cyclic loading
c. Diffusion of atoms
d. Movement of dislocations

86. Flow behaviour exhibited by clay suspensions is ———

a. Newtonian
b. Bingham plastic
c. Dilatent
d. Thixotropic

87. Which of the following is not a type of crypto-crystalline quartz?

a. Flint pebble
b. Sandstone
c. Opal
d. Agate

88. Talc is hydrated aluminium silicate containing ——— ions.

a. Calcium
b. Sodium
c. Magnesium
d. Potassium

89. Cornish stone is geologically altered variety of ——— rock.

a. Granite
b. Basalt
c. Feldspar
d. Quartz

90. The predominant gangue material in chrome ore is ———

a. Talc
b. Serpentine
c. Spodumene
d. Dolomite

91. Owing to poor sinterability, ——— is sintered by hot pressing.

a. SiC
b. SiAlON
c. Si_3N_4
d. BN

92. Presence of ———— as impurity in the silicon powder enhances α Si_3N_4 formation during nitriding of silicon.

a. Aluminium
b. Iron
c. Oxygen
d. Sodium

93. Select the correct sequence of materials with increasing starting temperature of oxidation

a. BN, AlN, Si_3N_4
b. BN, Si_3N_4, AlN
c. AlN, BN, Si_3N_4
d. AlN, Si_3N_4, BN

94. ———— is used as seed particles for extracting alumina in Bayer's process.

a. Boehmite
b. Diatomite
c. Gibbsite
d. Diaspore

95. Zirconia exists in ———— form in partially stabilized zirconia.

a. Cubic
b. Tetragonal
c. Monoclinic and tetragonal
d. Monoclinic and cubic

96. The Filter Press is mainly used in

a. Ceramic Insulator making
b. Cement making
c. Glass making
d. Refractory making

97. The 'Glass content' of porcelain bodies is in the Range of

a. 20 – 40 %
b. 50 – 80%
c. 80 – 90%
d. 10 – 20%

98. The Belleek China is a

a. Translucent ceramic containing significant amount of frit
b. Translucent ceramic containing low amount of frit
c. Opaque ceramic body containing a significant amount of frit
d. Translucent ceramic containing high amount of frit

99. Which of the following is an advantages for Lead compounds in Glaze?

a. It gives higher brilliance due to higher refractive index
b. It increases the co-efficient of expansion as compared to the alkalies
c. It increases the modulus of elasticity
d. It increases the strength of the fired body

100. ———— compound imparts yellow color in glass.

a. CdS
b. FeS
c. CuS
d. ZnS

101. ———— is not a glass former.

a. S
b. Se
c. Te
d. As

102. In unfired chemically bonded magnesite bricks ———— is used as a binder.

a. $CaSO_4$
b. $MgSO_4$
c. $Al_2(SO_4)_3$
d. K_2SO_4

103. ———— refractory undergoes bursting when in contact with iron oxide.

a. periclase
b. dolomite
c. chrome
d. mullite

104. _____ is a non vitreous bond used in abrasives.
   a. flint
   b. clay
   c. frit
   d. shellac

105. The specific gravity of diamond is _____
   a. 1.50 - 1.56
   b. 2.50 - 2.56
   c. 3.50 - 3.56
   d. 4.50 - 4.56

106. _____ boron nitride has a hexagonal layered structure similar to graphite.
   a. β
   b. γ
   c. α
   d. σ

107. _____ is a inorganic natural fibre.
   a. Nylon
   b. Jute
   c. Polyethylene
   d. Basalt

108. _____ fiber is called as Tyranno.
   a. Multifilament SiC
   b. Multifilament Al_2O_3
   c. Multifilament Carbon
   d. Multifilament Boron

109. Cracking catalysts can be made using
   a. bentonite
   b. kaolinite
   c. kaonite
   d. dolomite

110. _____ is an anti-ferroelectric material.
   a. lead zirconate
   b. lead titanate
   c. barium titanate
   d. strontium titanate

111. _____ is natural mineral used as a dielectric material.
   a. vermicullite
   b. bentonite
   c. halloysite
   d. mica

112. _____ material is used as an electrolyte in Na-S cell.
   a. single crystal of MgO
   b. beta alumina
   c. rutile
   d. quartz

113. As a biomaterial, graphite is used as _____
   a. Femoral balls
   b. Bone replacement
   c. Ear implants
   d. Heart valve components

114. Which of the following happens on titanium implants coated with hydroxyapatite?
   a. Slow bone apposition rates
   b. Bonding osteognesis
   c. Formation of fibrous capsule of protective tissue around implant
   d. Slow healing compared to uncoated implants

115. '5' in 45S5 Bioglass^R refers to _____
   a. Ratio of Ca/P
   b. Percentage of Silica
   c. Percentage of P_2O_5
   d. Ratio of Si/Ca

PART III

20 — PHARMACEUTICAL TECHNOLOGY

(Answer ALL questions)

56. Which of the following phospholipids is localized to a greater extent in the outer leaflet of the membrane lipid bilayer?
   a. Choline phosphoglycerides
   b. Ethanolamine phosphoglycerides
   c. Inositol phosphoglycerides
   d. Serine phosphoglycerides

57. The following substances are cell inclusions except
   a. Melanin
   b. Glycogen
   c. Lipids
   d. Centrosome

58. Out of 24 mols of ATP formed in TCA cycle, 2 molecules of ATP can be formed at "substrate level" by which of the following reaction?
   a. Citric acid→ Isocitric acid
   b. Isocitrate→ Oxaloacetate
   c. Succinylcat→ Succinic acid
   d. Succinic acid→ Fumarate

59. A nucleotide consists of
   a. A nitrogenous base like choline
   b. Purine + pyrimidine base + sugar + phosphorous
   c. Purine or pyrimidine base + sugar
   d. Purine or pyrimidine base + phosphorous

60. Maltose is a disaccharide of
   a. Glucose and Galactose
   b. Glucose and lactose
   c. Glucose and Glucose
   d. Fructose and lactose

61. Proteins contain
   a. Only L- α - amino acids
   b. Only D-amino acids
   c. DL-Amino acids
   d. Both (a) and (b)

62. RNA does not contain
   a. Uracil
   b. Adenine
   c. Hydroxy methyl cytosine
   d. Phosphate

63. Essential fatty acid:
   a. Linoleic acid
   b. Linolenic acid
   c. Arachidonic acid
   d. All of the above

64. A coenzyme containing non aromatic hetero ring is
   a. ATP
   b. NAD
   c. Biotin
   d. FMN

65. The ability of a pathogen to spread in the host tissues after establishing the infection is known as
   a. Adhesion
   b. Invasiveness
   c. Toxigenicity
   d. None of the above

66. Staining material of gram positive bacterium is
   a. Fast green
   b. Haematoxylon
   c. Crystal violet
   d. Safranin

67. Lysol is a
   a. Sterilent
   b. Disinfectant
   c. Antiseptic
   d. Antifungal agent

68. Histones are found in
   a. Prokaryotes
   b. Eukaryotes
   c. Viruses
   d. None of these

69. Which of the following is the process of converting sugar into alcohol?
   a. Oxidation
   b. Pasteurization
   c. Bleaching
   d. Fermentation

70. In batch fermentation:
   a. Substrates are added to the system all at once and runs until product is harvested
   b. Nutrients are continuously fed into the reactor and the product is siphoned off during the run
   c. New batches of microorganisms are screened for increased yield
   d. Small-scale production is used to synthesize product

71. While constructing the fermenter, which of the following is not required?
   a. High-speed Agitation and Aeration system
   b. Temperature control system
   c. pH control system
   d. Sample facilities

72. Hormone insulin helps in the regulation of
   a. Blood sugar
   b. Blood glucose
   c. Urine sugar
   d. Urine glucose

73. Cell-mediated immunity is the function of
   a. B lymphocytes
   b. T lymphocytes
   c. Plasma cells
   d. Basophils

74. Antibodies are
   a. Proteins
   b. Glycoproteins
   c. Phospholipids
   d. None of the above

75. Innate immunity is developed by
   a. Mechanical barriers
   b. Chemical barriers
   c. Both (a) and (b)
   d. None of the above

76. The hinge region of the immunoglobulin consists of the disulfide bond that held the heterotetramer together. Also, it contributes to the flexibility of the antibody chain. Which one of the following antibody classes does not have a hinge region?
   a. IgA
   b. IgD
   c. IgE
   d. IgG

77. Immediate type of hypersensitivity reactions are mediated by
   a. T-cells
   b. β-cells
   c. Mast cells
   d. Macrophages

78. Immunoglobulin is associated with anaphylactic delayed hypersensitivity reaction
   a. IgE
   b. IgA
   c. IgD
   d. IgM

79. Which of the following cells of the immune system do not perform phagocytosis?
   a. Macrophage
   b. Neutrophil
   c. Eosinophil
   d. Basophil

80. Antigen is an important constituent of the vaccines, to avoid contamination and increase the immune response, a component such as adjuvant/stabilizer is added during the manufacturing process of a vaccine. Name the least commonly used adjuvant used in vaccine development?
   a. Formaldehyde
   b. Aluminum sulfate
   c. Potassium aluminum sulfate
   d. Aluminum hydroxide

81. Which of the following statements is incorrect about the Live attenuated vaccine?
a. It is prepared using whole weakened living bacteria or virus
b. It can generate a long-term immune response with the administration of a single dose
c. Measles, MMR, and oral polio vaccine are live attenuated vaccines
d. It is stable at normal room temperature

82. Slugging process applied in the ____ method of tablet preparation
a. Wet Granulation
b. Dry Granulation
c. Both (a) and (b)
d. None of the above

83. _____ is sterile water for injection containing suitable antimicrobial agents.
a. Water for Injection
b. Sterile Water for Injection
c. Bacteriostatic Water for Injection
d. All the above

84. Viscoelasticity of the ____ shall be assessed by creep test
a. Lotions
b. Ointment
c. Suspension
d. Emulsion

85. Bloom strength of gelatin used in the capsule production is proportional to molecular weight of the gelatin which is measuring the
a. Adhesive strength of gelatin with dipping pins
b. Cohesive strength of the crosslinking that occurs between gelatin molecules
c. Cohesive strength of the solvent molecules
d. Adhesive strength of gelatin with other polymer

86. Which one of the following Equipments is the best for evaporating concentrated aqueous and thermostable liquors?
a. Climbing Film Evaporator
b. Evaporating Pan
c. Horizontal Tube evaporator
d. Triple effect evaporator

87. The rate of flow of the filtrate through the filter cake _____ to the thickness of the cake.
a. remains constant
b. is directly proportional
c. is inversely proportional
d. none of the above

88. Area Under the curve shall be calculated by
a. Trapezoidal method
b. Integration method
c. Cut and weigh method
d. All of the above

89. Choose the Level of correlation which states, the amount of drug dissolved at several time points of the dissolution profile to one or several pharmacokinetic parameters?
a. Level A
b. Level B
c. Level C
d. Multiple level C

90. Opaque nature of hard gelatin capsule is due to the following ingredient
a. Titanium dioxide
b. Sorbitol
c. Glycerin
d. Polyhydric alcohol

91. Zero order release kinetics is achieved in
a. Enteric coating
b. Sustain release
c. Controlled release
d. Immediate release

92. Downward creaming states _____ rate of sedimentation.
a. Same
b. Positive
c. Negative
d. No change

93. Energies required for the following transitions in increasing order
(P) $n \rightarrow \pi^*$
(Q) $\sigma \rightarrow \sigma^*$
(R) $n \rightarrow \sigma^*$
(S) $\pi \rightarrow \pi^*$
a. P<Q<R<S
b. Q<S<R<P
c. S<R<Q<P
d. P<S<R<Q

94. Mid IR Region mainly consists of
a. 4000-500 cm^{-1}
b. 4000-600 cm^{-1}
c. 4000-400 cm^{-1}
d. 4000-800 cm^{-1}

95. Overtones are mainly observed in
a. Near IR
b. Mid IR
c. Far IR
d. None of the above

96. Signal splitting in NMR arises from
a. Shielding effect
b. Spin-Spin decoupling
c. Spin-Spin coupling
d. Deshielding effect

97. Choose the correct sequence of MS procedure?
p. The ion signal is processed into mass spectra.
q. The ions are detected usually by a quantitative method.
r. The ions are separated according to their mass to charge ratio in an analyzer by electromagnetic fields.
s. The components of the sample are ionized by one of a variety of methods (e.g. by impacting them with an electron beam) which result in the formation of charged particles.
w. A sample is loaded into the MS instrument and undergoes vaporization
a. p→q→r→s→w
b. w→s→r→q→p
c. p→w→r→s→q
d. q→w→r→s→p

98. Ionization interference can be eliminated by addition of
a. EDTA
b. Cryolite
c. Cesium salts
d. Lathanum Chloride

99. Atomic emission spectroscopy is
a. The measurement of absorbance of emitted light at a particular wavelength from the atoms that are exited thermally
b. The measurement of intensity of emitted light at a particular wave length from the atoms that are excited by monochromatic light.
c. The measurement of intensity of emitted light at a particular wave length from the atoms that are exited thermally.
d. The measurement of intensity of absorbed light at a particular wavelength from the atoms that are exited thermally

100. In which Chromatography stationary phase is more polar than mobile phase?
a. Reversed chromatography
b. Liquid liquid Chromatography
c. Ion exchange
d. None of the above

101. Which force is involved in the Chromatography?
a. Hydrogen bonding
b. London force
c. Electric static force
d. All of the above

102. In open tubular GC columns the outer layer is constructed with
(P) Polyimide
(Q) Silica glass
(R) Aluminium
(S) Thermostable plastic
a. R, S
b. P, Q
c. Q, R
d. P, R

103. For the separation of which of the following substances, Gas-solid chromatography is being used?
a. Thermally stable organic components
b. Low molecular weight gaseous species
c. Thermally stable inorganic components
d. Volatile organic components

104. Which of the following is not an advantage of Syringe type pumps used in High pressure liquid chromatography?
a. Independent of viscosity
b. Pulse-less flow
c. Unlimited solvent capacity
d. High pressure capability

105. Which of the following pulse damper takes up some amount of the pulsation energy which is released to provide smooth pressure without pulsations?
a. Flexible bellows or compressible gas passed through tee columns
b. Flexible inert diaphragm
c. Electronic pulse damper
d. Electrical pulse damper

106. The particle size in HPTLC is
   a. 0.5μm
   b. 1 μm
   c. 5 μm
   d. 10 μm

107. The relative adsorption of each component of the mixture is expressed in terms of its _____.
   a. Acceleration factor
   b. Retardation factor
   c. Both acceleration and retardation factor
   d. None of the above

108. Match the following drugs with their correct classifications-

i. Betaxolol	A. β_1-adrenergic agonist
ii. Carvedilol	B. Mixed acting sympathomimetics
iii. Epinephrine	C. Mixed α/β blocker
iv. Amphetamine	D. Nonselective adrenergic agonists

   a. i-A, ii-C, iii-D, iv-B
   b. i-D, ii-B, iii-C, iv-A
   c. i-A, ii-C, iii-D, iv-B
   d. i-B, ii-D, iii-C, iv-A

109. Match the following with correct classifications of the drugs.

i. Albuterol	A. β_1-adrenergic agonist
ii. Dopamine	B. Nonselective adrenergic agonist
iii. Clonidine	C. β_2-adrenergic agonist
iv. Epinephrine	D. Selective α_2-adrenergic agonist

   a. i-B, ii-D, iii-C, iv-A
   b. i-C, ii-A, iii-D, iv-B
   c. i-D, ii-A, iii-C, iv-B
   d. i-D, ii-B, iii-C, iv-A

110. Which amongst the following statements is/are incorrect related to the SAR of opiates?
   I. Replacement of alcoholic hydroxyl with $-OC_2H_5$ makes the compound 2.4 times more active than morphine.
   II. Replacement of alcoholic hydroxyl with $-OCOCH_3$ will also activates the compound by 4.2 times.
   III. Replacement of alcoholic hydroxyl with ketone group inactivates the compound and makes it lesser active.
   a. I, II
   b. I
   c. III
   d. None

111. Patient with hypercholesterolemia taking a combination of two anti hyperlipidemic drugs. After 4 days the patient complaining of sever myalgia and increase in creatine kinase. Which drugs did this patient use?
   a. Cholestyramine and Lovastatin
   b. Fenofibrate and Ezetimibe
   c. Lovastatin and Fenofibrate
   d. Niacin and Ezetimibe

112. Which of the following approach is considered under the 'Ligand based drug designing'?
   a. Molecular docking
   b. Pharmacophore modeling
   c. QSAR Modeling
   d. (b) and (c) both

113. QSAR method involves
   a. Target structure
   b. Target properties
   c. Ligand x-ray structure
   d. Ligand properties

114. Lipinski's rule of five is used for
   a. Docking
   b. Similarity search
   c. Drug likeness
   d. Dynamics simulation

115. What is meant by ADME in pharmacokinetics?
   a. Affinity, dosage, marketing, efficacy
   b. Absorption, distribution, metabolism, excretion
   c. Agonism, dependence, mobility, efficiency
   d. Antagonism, deficiency, mean, efflux

PART III

21 – PHYSICS

(Answer ALL questions)

56. The minimum value of angular momentum by coupling three angular momenta 1, 3/2 and 5/2 is

a. –5
b. ½
c. 0
d. 1

57. The direction of vector in space is specified by

a. One angle
b. Two angle
c. Three angle
d. No angle

58. The resultant of two forces of equal magnitudes is also equal to the magnitude of the forces. The angle between the two forces is

a. 30
b. 60
c. 90
d. 120

59. If a car is moving forward, what is the direction of the moment of the moment caused by the rotation of the tires?

a. It is heading inwards, i.e. the direction is towards inside of the car
b. It is heading outwards, i.e. the direction is towards outside of the car
c. It is heading forward, i.e. the direction is towards the forward direction of the motion of the car
d. It is heading backward, i.e. the direction is towards the back side of the motion of the car

60. For a body moving in a circular path, the work done by the centripetal force is _____

a. Negative
b. Positive
c. Constant
d. Zero

61. Which of the following is not a conservative force?

a. Elastic force
b. Gravitational force
c. Force of friction
d. Electrostatic force

62. Calorie is defined as the amount of heat required to raise the temperature of 1g of water by 1°C and it is defined under which of the following conditions?

a. From 14.5°C to 15.5°C at 760mm of Hg
b. From 98.5°C to 99.5°C at 760mm of Hg
c. From 13.5°C to 14.5°C at 76mm of Hg
d. From 3.5°C to 4.5°C at 76mm of Hg

63. Specific heat capacity of a substance is equal to

a. the amount of heat required to raise the temperature of a 1 kg of a substance by 1 K
b. the amount of heat required to raise the temperature of a substance by 1 K
c. the amount of heat required to change the phase of a substance from solid to liquid without any change in temperature
d. the amount of heat required to change the phase of a substance from liquid to gas without any change in temperature

64. The rate equation used to describe the mechanism of convection is called Newton's law of cooling. So rate of heat flow by convection doesn't depend on

a. Convective heat transfer coefficient
b. Surface area through which heat flows
c. Time
d. Temperature potential difference

65. A sound source with a frequency of 790Hz moves away from a stationary observer at a rate of 15m/s. What frequency does the observer hear? The speed of sound is 340m/s.

a. 655 Hz
b. 757 Hz
c. 775 Hz
d. 826 Hz

66. A Michelson interferometer is illuminated with monochromatic light, when one of the mirrors is moved through a distance of 25.3 μm, 92 fringes pass through the cross wires. The wavelength of the monochromatic light is

a. 500nm
b. 550nm
c. 600nm
d. 650nm

67. Consider two wires X and Y. The radius of wire X is 3 times the radius of Y. If they are stretched by the same load then the stress on Y is

a. Equal to that on X
b. Thrice that on X
c. Nine times that on X
d. Half that on X

68. With an increase in temperature, the viscosity of liquid and gas, respectively will

a. Increase and increase
b. Increase and decrease
c. Decrease and increase
d. Decrease and decrease

69. Which of the following is not a scalar?

a. Viscosity
b. Surface tension
c. Pressure
d. Stress

70. The wettability of a surface by a liquid depends primarily on

a. Viscosity
b. Surface tension
c. Density
d. Angle of contact between the surface and the liquid

71. Let 2.4×10^{-4} J of work is done to increase the area of a film of soap bubble from 50 cm^2 to 100 cm^2. Calculate the value of surface tension of soap solution.

a. $2.4 \times 10^{-2} Nm^{-1}$
b. $24 \times 10^{-2} Nm^{-1}$
c. $24 \times 10^{-1} Nm^{-1}$
d. $2.4 \times 10^{-3} Nm^{-1}$

72. Which charge configuration produces a uniform electric field?

a. point Charge
b. Infinite uniform line charge
c. Uniformly charged infinite plane
d. Uniformly charged spherical shell

73. A parallel plate capacitor stores a charge Q at a voltage V. Suppose the area of the parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?

a. Capacitance
b. Charge
c. Voltage
d. Energy density

74. Two points A and B are maintained at a potential of 7 V and –4 V respectively. The work done in moving 50 electrons from A to B is

a. 8.80×10^{-17}J
b. -8.80×10^{-17}J
c. 4.40×10^{-17}J
d. 5.80×10^{-17}J

75. Two identical conducting balls having positive charges q1 and q2 are separated by a center to center distance r. If they are made to touch each other and then separated to the same distance, the force between them will be

a. less than before
b. same as before
c. more than before
d. zero

76. An electric dipole is placed at an alignment angle of 30° with an electric field of $2\times105\,NC^{-1}$. It experiences a torque equal to 8 N m. The charge on the dipole if the dipole length is 1 cm is

a. 4 mC
b. 8 mC
c. 5 mC
d. 7 mC

77. Calculate the number of electrons in one coulomb of negative charge

a. 6.25×10^{18}
b. 6.25×10^{17}
c. 1.6×10^{-18}
d. 1.6×10^{-19}

78. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω is

a. 0.2 Ω
b. 0.5 Ω
c. 0.8 Ω
d. 1.0 Ω

79. Circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is

a. 1.0 A.m^2
b. 1.2 A.m^2
c. 0.5 A.m^2
d. 0.8 A.m^2

80. When the current changes from +2A to –2A in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is

a. 0.2 H
b. 0.4 H
c. 0.8 H
d. 0.1 H

81. Among Si and GaAs,

a. both are direct bandgap materials
b. both are indirect bandgap materials
c. Si is direct while GaAs is indirect
d. Si is indirect while GaAs is direct

82. Which of the following exhibits spontaneous magnetization?

a. Paramagnetic material
b. Ferrimagnetic material
c. Diamagnetic material
d. Ferromagnetic material

83. Which phenomenon is best explained by the particle nature of light?

a. The Doppler Effect
b. Polarization
c. The photoelectric effect
d. Interference

84. Which color of light has the greatest energy per photon?

a. Blue
b. Green
c. Violet
d. Red

85. Proton has a mass,

a. 1637 times of an electron
b. 1737 times of an electron
c. 1837 times of an electron
d. 1937 times of an electron

86. Weak nuclear forces act on _____

a. Both hadrons and leptons
b. Hadrons only
c. All particles
d. All charged particles

87. A semiconductor is formed by _____ bonds.

a. Covalent
b. Electrovalent
c. Co-ordinate
d. None of the above

88. Semiconductor has _____ temperature coefficient of resistance.

a. Positive
b. Zero
c. Negative
d. None of the above

89. When a pure semiconductor is heated, its resistance _____

a. Goes up
b. Goes down
c. Remains the same
d. None of the above

90. When a pentavalent impurity is added to a pure semiconductor, it becomes _____

a. An insulator
b. An intrinsic semiconductor
c. p-type semiconductor
d. n-type semiconductor

91. Addition of pentavalent impurity to a semiconductor creates many _____

a. Free electrons
b. Holes
c. Valence electrons
d. Bound electrons

92. A pn junction acts as a _____

a. Controlled switch
b. Bidirectional switch
c. Unidirectional switch
d. None of the above

93. The emitter of a transistor is _____ doped

a. lightly
b. heavily
c. moderately
d. none of the above

94. The input impedance of a transistor is _____

a. high
b. low
c. very high
d. almost zero

95. A Zener diode is used as _____

a. an amplifier
b. a voltage regulator
c. a rectifier
d. a multivibrator

96. An oscillator produces _____ oscillations

a. Damped
b. Undamped
c. Modulated
d. None of the above

97. The inputs of a NAND gate are connected together. The resulting circuit is _____

a. OR gate
b. AND gate
c. NOT gate
d. None of the above

98. The universal gate is _____

a. NAND gate
b. OR gate
c. AND gate
d. None of the above

99. Which of the following theories cannot be explained by classical theory?

a. Electron theory
b. Lorentz theory
c. Photo-electric effect
d. Classical free electron theory

100. Thermal conductivity is due to

a. Photons only
b. phonons and free electrons
c. free electrons only
d. phonons only

101. What happens when a material is heated?

a. magnetized
b. density increases
c. it expands
d. young's modulus increases

102. Which of the following is an effective coolant?

a. Oil
b. Mercury
c. Water
d. Acids

103. A completely filled band is called

a. Conduction band
b. Valence band
c. Forbidden band
d. Core band

104. Which one has the greatest energy gap?

a. Semiconductor
b. Conductor
c. Metals
d. Insulators

105. How does ionic polarisation occur?

a. Splitting of ions
b. Passing magnetic field
c. Displacement of cations and anions
d. Never occurs

106. When does a dielectric become a conductor?

a. At avalanche breakdown
b. At high temperature
c. At dielectric breakdown
d. In the presence of magnetic field

107. Which of the following materials exhibit Ferro-electricity?

a. Iron
b. Platinum
c. Hydrogen
d. Rochelle salt

108. The superconducting materials will be independent of which of the following?

a. Magnetic field
b. Electric field
c. Magnetization
d. Temperature

109. The superconducting state is perfectly _____ in nature.

a. Diamagnetic
b. Paramagnetic
c. Ferromagnetic
d. Ferrimagnetic

110. The binding energy for a Cooper pair is

a. 10^-2 eV
b. 10^-4 eV
c. 10^-6 eV
d. 10^-8 eV

111. The magnetic lines of force cannot penetrate the body of a superconductor, a phenomenon is known as

a. Isotopic effect
b. BCS theory
c. Meissner effect
d. London theory

112. Which of the following conductor has highest critical temperature?

a. Aluminium
b. Zinc
c. Molybdenium
d. Tin

113. Coating the nano crystals with the ceramics is carried that leads to _____

a. Corrosion
b. Corrosion resistant
c. Wear and tear
d. Soft

114. Which of the following are the most common coordination numbers for ceramic materials?

a. 2 and 3
b. 6 and 12
c. 6, 8 and 12
d. 4, 6 and 8

115. Carbon nano tubes are also called as _____

a. Bucky tubes
b. Bulky tubes
c. Bulk tubes
d. Buck balls

PART III

22 — PRINTING TECHNOLOGY

(Answer ALL questions)

56. _____ is a non-continuous light source
   a. Tungsten
   b. Daylight
   c. Sodium Vapour
   d. Incandescent light

57. Calculate the number of reproducible colors in RGB mode when bit depth is 8 bits/channel
   a. 8
   b. 256
   c. 16.78 millions
   d. 4.29 billions

58. In graphic design, _____ is the emphasis to show order of communication
   a. Hierarchy
   b. Monospace
   c. Knoll
   d. Aspect ratio

59. _____ file format in e-publishing is not re-flowable and has fixed page layout
   a. .epub
   b. .mobi
   c. .rtf
   d. .pdf

60. In XML, _____ declaration above contains a reference to a DTD file
   a. Element
   b. Entity
   c. Doctype
   d. Heading

61. _____ uses recorded detail of raster structure with high resolution
   a. Platereader
   b. Densitometer
   c. Colorimeter
   d. Spectrophotometer

62. _____ tag refers to transformation of colors from device to PCS using perceptual rendering intent
   a. A2B0
   b. A2B1
   c. B2A0
   d. B2A1

63. In Raster Image Processor, the objects of the display list are converted into device specific resolution of the output device in _____ module
   a. Imaging
   b. Interpreter
   c. Renderer
   d. Screening

64. In Life Cycle Assessment for packaging, _____ phase is the information-gathering phase for all environmental inputs and outputs for all parts of the product system that is being examined.
   a. Goals and scoping
   b. Life cycle inventory
   c. Life cycle impact assessment
   d. Interpretation

65. _____ refers to this folding carton design style

   a. Reverse tuck
   b. Tuck and tongue
   c. Tuck and seal end
   d. Overlap and seal end

66. The ISO standard for colour measurement is
   a. ISO 2846-1:2017
   b. ISO 13655:2017
   c. ISO 15076-1:2010
   d. ISO 15930-7:2010

67. In gravure cylinder engraving, the cells produced by _____ engraving are half-autotypical

a. Direct transfer
b. Diffusion etch
c. Electromechanical
d. Laser

68. To increase the print length circumferentially the printer can resort to:

a. Stretch the plate
b. Condition the paper
c. Increase the blanket packing
d. Increase the plate packing.

69. Temporary care for a smashed blanket is to apply:

a. Methyl Ethyl Ketone
b. Iso Propyl Alcohol
c. Petrol
d. Benzene

70. Using Brunner equation what is the trap value of Red overprint, if the Green Filter readings of Red is 1.02, Magenta is 1.35, and Yellow is 0.07:

a. 84
b. 64
c. 74
d. 94

71. In an inking system, contact between a fixed roller and the transfer roller is established with:

a. Lock nut
b. Lever
c. Set screws
d. Eccentric bush

72. Double sheets could be avoided by

a. Adjusting the pile height governor,
b. Increasing the blast air,
c. Reducing Vacuum in suckers,
d. Reducing the blast air.

73. Absorbency of paper is taken care in which stage of paper making?

a. Beating
b. Loading
c. Sizing
d. Colouring

74. The purpose of Dandy roll is:

a. Impart water mark
b. Squeeze water
c. Dry the paper
d. Apply pressure

75. The total range of colors that can be rendered by a process color printer is called:

a. Color separation
b. Color portability
c. Color transform
d. Color gamut

76. An alternative to gum arabic is:

a. Liquefied rosin
b. Carboxy methyl cellulose
c. Sodium meta bisulphate
d. Bichromate

77. For digital camera images, the two common file formats are:

a. JPEG & TIFF
b. GIF & BMP
c. JDF & GIF
d. BMP & PICT

78. Ink doesn't adhere to substrate due to:

a. Surface tension
b. Cohesion tension
c. Coercive tension
d. Adhesion tension

79. Purpose of chilling unit in heat set press:

a. To increase the moisture content
b. To set the binder and pigment
c. To reduce the temperature
d. To reduce the pH of paper

80. Metallic ring used to reinforce a hole to prevent tearing-off of the board

a. Guarding
b. Tipping
c. Eyeletting
d. Banding

81. The processes of creating recessed relief images and designs in paper and other materials.

a. Embossing
b. Debossing
c. Glazing
d. Scorching

82. _____ is used to take paper, fold it, insert it into an envelope and seal the envelope.

a. Folder inserters
b. Folder sealers
c. Z fold
d. Gripper edge fold

83. Ring binding is also called as

a. Loose leaf binding
b. Mechanical binding
c. Perfect binding
d. Case binding

84. The placing of a section within another section is known as

a. Insetting
b. Inserting
c. Collating
d. Gathering

85. Thin layer of coating material applied to the printed material is called

a. Varnishing
b. Lamination
c. Gumming
d. Gold foiling

86. Buffer storage in mailroom system is

a. Storing the unprinted sheets
b. Storing the printed sheets
c. Storing the materials used in printing
d. Storing the rejected newspapers

87. These are string like materials made from flax and have very long fibers, different thickness and twists.

a. Buckram
b. Tapes and webbings
c. Cords
d. Vellum

88. The method used to prevent the wearing and dog-earing of the square corners of small pocket books.

a. Guarding
b. Drilling
c. Perforating
d. Round cornering

89. In _____ method, the sections are sewn without tapes or cords but with thread only.

a. French sewing
b. Flexible sewing
c. Saw-in sewing
d. Sunk cord sewing

90. Dip shear action of the knife means

a. The knife descends down vertically
b. The knife descends down at an angle
c. The knife descends and cut at 90°
d. The knife descends down vertically and cuts at an angle

91. The primary function of paraffin waxes as coating material is

a. Low temperature sealability
b. Grease resistance and Barrier properties
c. Heat sealability and grease resistance
d. Gloss

92. The non-wood fibre sources used for making paper is

a. Oak, Pine
b. Beech, Bagasse
c. Hemp, Bagasse
d. Bagasse, Birch

93. _____ properties are important for paperboard for the process of cutting and creasing to make a box in packaging applications

a. Pick resistance, moisture
b. Gloss and Haze
c. Tear, Tensile Strength
d. Smoothness and porosity

94. If the press speed increases the viscosity of the printing ink _____

a. Increases
b. Decreases
c. Remains the same
d. Increases and then decreases

95. The tack value of offset multicolour printing is C = 25, M = 28, Y = 24 and B = 30 _____ printing sequence has to be followed during printing to avoid printing problems

a. MCYB
b. YMBC
c. YCMB
d. BMCY

96. The cobb value of sized board is _____ compared to unsized board

a. Higher
b. Lower
c. Remains the same
d. None of the above

97. Generally, in corrugation the grammage of fluting medium lies in the region between _____

a. 80-250 GSM
b. 400-600 GSM
c. 40-60 GSM
d. 350-450 GSM

98. _____ is the most important property of a cushioning material to protect the packed content even at repeated stress environment

a. Elongation
b. Tensile Strength
c. Compression Strength
d. Recovery

99. The difference between UV inks and UV LED inks are based on the variations in the constituents of

a. Pre-polymers
b. Additives
c. Diluents
d. Photo-initiators

100. In paper making _____ property is increased and suddenly decreased by increasing the beating process

a. Tensile
b. Dimensional Stability
c. Burst
d. Tear

101. _____ is the TAPPI standard followed to test the tear property of paper

a. T414
b. T569
c. T511
d. T489

102. In X-ray pattern the amorphous polymers have _____ peak

a. Sharp
b. Diffuse or broad
c. Diffuse and broad
d. None of the above

103. The plastic trays used in food packaging applications are produced by _____ process

a. Injection molding
b. Blow molding
c. Thermoforming
d. Extrusion

104. A brand's power derived from the goodwill and recognition it has earned over time is called _____

a. Brand Equity
b. Brand Architecture
c. Brand Promotion
d. All the above

105. A brand's action perceived by a person is called _____

a. Brand Management
b. Brand Promotion
c. Brand alignment
d. Brand experience

106. Method of launching a new product by using an existing brand name is called.

a. Brand extension
b. Brand Management
c. Brand Equity
d. Brand Awareness

107. How a business wants to communicate about the style logo and other visual elements by a brand is called as _____

a. Brand Extension
b. Brand Equity
c. Brand Management
d. Brand Identity

108. A unique bundle of associations within the minds of target customers is called as _____

a. Brand Equity
b. Brand Extension
c. Brand Image
d. All the above

109. Categories of brands that share specific universally recognizable personality traits are called _____

a. Brand Archetype
b. Brand Equity
c. Brand Identity
d. Brand Image

110. A thorough examination of a brand's performance is called

a. Branding
b. Brand Audit
c. Brand Removal
d. Brand Identity

111. LCA in sustainable packaging is the abbreviation for :

a. Life cycle Assessments
b. Life cycle Audit
c. Large cycle Action
d. All the above

112. The total emissions caused by an individual, event, organization or package is called

a. Carbon footprint
b. Sustainable package
c. Ecofriendly pack
d. All the above

113. A term in marketing deceptively used to promote an organization's product as environmental friendly is called

a. Green Washing
b. Green Labelling
c. Green Housing
d. White Washing

114. A digital invisible marking that is applied to cartons, lables, closures etc. is called

a. Cryptoglyph
b. Masking
c. Watermark
d. All the above

115. A type of intellectual property of an organization which is a recognizable sign or design is called

a. Trademark
b. Logo
c. Symbol
d. Identity

PART III

23 — PRODUCTION AND INDUSTRIAL ENGINEERING

(Answer ALL questions)

56. The force of friction which occurs when an object is in motion is known as
    a. static friction
    b. dynamic friction
    c. limiting friction
    d. fluid friction

57. The type of stress that results in a bolt, when subjected to an external load, is called
    a. shear stress
    b. compressive stress
    c. thermal stress
    d. residual stress

58. Which of the following type of cam is used, in order to minimize jerks?
    a. flat
    b. involute
    c. simple harmonic
    d. cycloidal

59. The unbalanced force acting vertically upward or downward due to balancing of the reciprocating parts in a locomotive varies
    a. directly with the speeds
    b. directly with the square of the speeds
    c. inversely with the speeds
    d. inversely with the square of the speeds

60. Which one of the following is the transmission dynamometer?
    a. prony brake dynamometer
    b. fluid friction dynamometer
    c. torsion dynamometer
    d. band brake dynamometer

61. Hot-die forging is also known as
    a. Embossing
    b. Roll forging
    c. Precision forging
    d. Isothermal forging

62. Which of the following operations can be used to provide insulation on cables?
    a. Upset forging
    b. Swaging
    c. Embossing
    d. Roll forging

63. Which of the following forging operations is also known as precision forging?
    a. Open-die
    b. Impression-die forging
    c. Roll forging
    d. Flashless forging

64. Which of the following metal is best suitable for extrusion, either hot or cold?
    a. Zinc
    b. Magnesium
    c. Copper
    d. Aluminium

65. Compound die performs
    a. Only one operation and that too at one work station
    b. Two or more operations at one station in one stroke
    c. Two or more operations at different station in one stroke
    d. Two operations at two different work station in the same stroke

66. In metal subjected to cold working, strain hardening is due to
    a. Fracture mechanism
    b. Twinning mechanism
    c. Dislocation mechanism
    d. Slip mechanism

67. In arc welding, the current value is decided by which factor

a. Thickness of the plate
b. Size of the electrode
c. Length of the welding portion
d. Voltage across the arc

68. In MIG welding, the metal is transferred in the form of

a. A fine spray of metal
b. Molten drops
c. Weld pool
d. Very fine metal

69. Which of the following process could produce strongest components?

a. Die-casting
b. hot rolling
c. Extrusion
d. Forging

70. Which of the following is not a casting defect?

a. Hot tear
b. Blow hole
c. Scab
d. Decarburization

71. Which of the following international standard is made of a bronze bar (82% Cu, 13% Tin, 5% Zn)?

a. International prototype meter
b. International standard yard
c. Meter Des Archives
d. Henry VII yard

72. The algebraic difference between the result of measurement and the conventional true value of the quantity measured is known as

a. Characteristic error
b. Relative error
c. Loading error
d. True absolute error

73. The main purpose of a steel cube reflector in an autocollimator is:

a. To provide a 90 degree standard in 3 planes
b. For measuring concavity
c. Calibrate surface plate
d. For setting but not checking parallels and perpendiculars

74. Which of the following is not true for the method of measurement of surface finish by micro interferometer?

a. Usage of Optical flat
b. Depth of defect can't be measured
c. Usage of monochromatic light
d. The Interference bands and their width plays an important role in identification of the defect

75. _____ is the type of pitch error in screw thread where the pitch of the screw thread is perfect but the form is not:

a. Periodic error
b. Progressive error
c. Drunken error
d. Effective error

76. The machine that is used for conducting rolling tests is:

a. Parkinson's gear tester
b. Tooth caliper
c. Base pitch measuring instrument
d. Involute profile testing machine

77. Which of the following technique is not suitable to measure large diameter of parts or large gaps?

a. Laser triangulation sensor
b. Scanning laser technique
c. Photodiode array imaging
d. Diffraction pattern technique

78. Find the metal removal rate (MRR) from the given data (in mm^3/minute). cutting speed (cs) = 50 mm/minute, depth of cut(d) = 10mm, feed(f) = 0.1 mm/revolution.

a. 50
b. 500
c. 5000
d. 15000

79. Graphical optimal value for Z can be obtained from

a. Corner Points of feasible region
b. Corner points of infeasible region
c. Corner points of the solution region
d. Center points of the infeasible region

80. In a departmental store customers arrive at a rate of 18 customers per hour. The average number of customers that can be handled by cashier is 5.5 per 15 minutes. What is the service rate?

a. 18
b. 0.305
c. 22
d. 3.27

81. A steel with 0.8 percent carbon is known as

a. Eutectoid steel
b. Hypereutectoid steel
c. Hypo eutectoid steel
d. Eutectic steel

82. The chemical bonds formed due to the forces between atoms are _____ in nature.

a. electromagnetic
b. electrostatic
c. gravitational
d. None of the above

83. Addition of magnesium to cast iron increases its

a. hardness
b. creep strength
c. corrosion resistance
d. ductility and strength in tension

84. Thermoplastic materials are those materials which

a. are formed into shape under heat and pressure and results in a permanently hard product
b. do not become hard with the application of heat and pressure and no chemical change occurs
c. are flexible and can withstand considerable wear under suitable conditions
d. are used as a friction lining for clutches and brakes

85. The process of growing large molecules from small molecules is known as,

a. Polymerization
b. Polymorphism
c. Hysteresis
d. allotropy

86. Number of degree of freedom of a workpiece in space is equal to

a. 10
b. 12
c. 14
d. 16

87. _____ helps in establishing the interchangeability of products

a. Standardization
b. Simplification
c. Diversification
d. Specialization

88. The following is also known as overhead costs or on costs.

a. Cost of direct labour
b. Cost of indirect labour
c. Direct expenses
d. Indirect expenses

89. The following type of jig is used to drill a series of equidistant hole along a circle

a. Index jig
b. Plate type jig
c. Open type jig
d. Pot type jig

90. Life-cycle engineering is also called

a. Green design
b. Application oriented
c. Creative design
d. Matured Product Design

91. An analysis and estimation method of cost, by classifying cost accounts as fixed or variable with respect to specific output level is considered as

a. manufacturing analysis method
b. price analysis method
c. unit analysis method
d. account analysis method

92. An MRP system that provides feedback to the capacity plan, master production schedule, and production plans is called

a. lot-sizing
b. load report
c. closed-loop MRP
d. system nervousness.

93. The correct order of procedure in the method study is

a. Select – Record – Examine – Develop – Define – Install – Maintain
b. Select – Define – Examine – Develop – Record – Install – Maintain
c. Select – Record – Develop – Examine – Define – Install – Maintain
d. Select – Record – Examine – Define – Develop – Install – Maintain

94. Formal methods of work measurement exclude which of the following?

a. Time study method
b. Predetermined data approach
c. Systems approach
d. Work sampling method

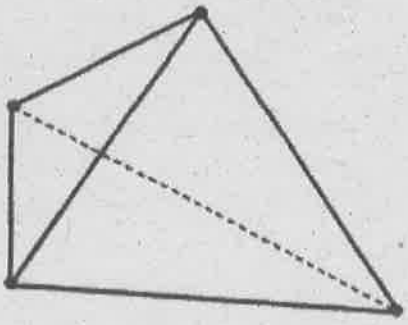
95. If natural light is used as the principal means of illumination at workspace, windows area needs to be equal to _____ percent of the floor area.

a. 20
b. 30
c. 40
d. 50

96. Which one of the following is a neutral file format?

a. IGES
b. OpenGL
c. GKS
d. VDM

97. _____ is the Euler's equation for the part shown in figure below, Where F is the number of faces, E is the number of edges and V is the number of vertices



a. F + E + V = 2
b. F – E + V = 2
c. F – E + V = 4
d. F + E – V = 4

98. Which one among the following transformations can be done using vector addition?

a. Scaling
b. Reflection
c. Translation
d. Rotation

99. Stacking thin sheets built layer by layer on top of each other and then parts are cut according to the part's cross section is known as

a. Powder Bed Fusion
b. Sheet Lamination
c. Vat Polymerization
d. Material Jetting

100. The tool of a CNC machine has to move along a circular arc in clock-wise direction from (5,5) to (10,10) while performing an operation. The centre of the arc is at (10,5). Which one of the following CNC tool path command performs the above mentioned operation?

a. N010 G02 X5 Y5 R5
b. N010 G03 X5 Y5 R5
c. N010 G03 X10 Y10 R5
d. N010 G02 X10 Y10 R5

101. When the rough turning cycle G71 is used, which letters identify the amount of stock to leave for finish pass X-axis and Z-axis respectively?

a. U and V
b. U and W
c. X and Z
d. P and Q

102. The positioning accuracy of robotic arm is the highest in the following type/configuration of a robot

a. Cartesian robot
b. Cylindrical Robot
c. Articulated jointed arm robot
d. Spherical co-ordinate robot

103. A pallet is used for

a. automating material handling and fixture
b. storing the job
c. guiding the job
d. automating job rejection

104. Group Technology uses the following coding system

a. GRPS
b. OPTIM
c. ADQS
d. OPITZ

105. Which one of the following is not a part of FMS data file?

a. Part program file
b. Routing file
c. Pallet reference file
d. Maintenance file

106. Malcolm Baldrige national quality award (MBNQA) is for

a. Total Quality Management
b. International Standard Organization
c. Total Productive Maintenance
d. Total Quality Control

107. Which of the following is for Environment management?

a. ISO-9000
b. ISO-14000
c. ISO-26000
d. ISO-31000

108. What is ISO?

a. Indian organization for standard
b. International standards organization
c. International organization for standard
d. Indian standards organization

109. When cpk is less than one,

a. Process is not capable
b. Process is stable
c. Process is highly capable
d. cpk is not related to process capability

110. Technically speaking, Six Sigma involves driving towards how many defective parts per million?

a. 1
b. 6200
c. 230
d. 3.4

111. The time elapsed from the point the machine fails to perform its function to the point it is repaired and brought into operating condition is known as

a. Down time
b. Break Down time
c. Both (a) and (b)
d. Idle time

112. For a system composed of 400 interdependent components that each have individual reliability of 0 .99, the overall system will be working for less than _____ of the time.

a. 50%
b. 5%
c. 25%
d. 75%

113. If a batch of 200 electronic components is tested for 400 hours and 5 fail during the test, what is the failure rate as a percentage?

a. 1.25%
b. 10%
c. 2.5%
d. 5%

114. The number of failures over a period of time is called:

a. The failure rate
b. The average failure point
c. The mean time between failure
d. None of the above

115. Average amount of time that a device or product functions before failing

a. Mean Time To Repair(MTTR)
b. Mean Time Between Failures(MTBF)
c. Mean Time To Failures(MTTF)
d. Time Between Failure (TBF)

PART III

24 — SOCIAL SCIENCES

(Answer ALL questions)

56. The first person to record the existence of regular relationship between size of cities and their ranks

a. Auerbach
b. G.K. Zipf
c. Christaller
d. H.A. Simmon

57. Ranks and sizes of a region drawn on a double logarithmic graph are more or less

a. U shaped
b. S shaped
c. C shaped
d. I shaped

58. Components of physical environment

a. Norms
b. Neighbourhood
c. Vegetation
d. Communication system

59. Factors considered for the delimitation of a socio-cultural region

a. Climate
b. Vegetation
c. Language
d. Urbanism

60. Concept of a nodal region

a. Similarities
b. Areal linkage
c. Single feature
d. Natural linkage

61. The Central Place Theory was originally published by

a. Shonk Wailer
b. Walter Christaller
c. Mushinski
d. Frankston

62. Low order settlements as per the Central Place Theory is one with

a. Low population
b. Poor employment
c. Low order of services
d. Low population density

63. Definition for 'range of distance' under the Central Place Theory

a. Minimum distance people will travel to purchase goods or services
b. Maximum distance people will travel to purchase goods or services
c. Minimum distance traders will travel to sell their ware
d. Maximum distance traders will travel to sell their products

64. The minimum population that is required to bring about the goods or services under the Central Place Theory is the concept of

a. Vestibule
b. Threshold
c. Inception
d. Brink

65. The trend of urbanisation in India reveals a correlation between urban development and

a. Economic development
b. Spatial development
c. Conservation
d. Cultural development

66. The leapfrogging of the level of urbanisation of Tamil Nadu in 2001 attributed to the

a. Constitution (74th Amendment) Act, 1992
b. Constitution (73rd Amendment) Act, 1992
c. Tamil Nadu Panchayat Act, 1994
d. Tamil Nadu Panchayat Building Rules, 1996

67. Regional Planning is a

a. Sectoral Plan
b. Spatial Plan
c. Physiographic Plan
d. Central Plan

68. The prime objective of the regional plan is to

a. Develop the targeted area
b. Promote rural development
c. Reduce disparities
d. Focus on hill area development

69. An important economic reform in Trade Sector

a. Opening the economy to Foreign Direct Investment
b. Opening up the insurance sector to private insurers
c. Abolition of interest rate control
d. Elimination of quantitative import licensing

70. The phenomenon of globalisation has negatively affected the

a. Poor
b. Land value
c. Employment
d. Income

71. In Sociology , society refers to:

a. Members of a specific in-group
b. Pattern of the norm of interaction
c. Congregation of people
d. People with laws and customs

72. According to _____, Society is a web of social relation

a. Cooley
b. Maclver
c. Parsons
d. Leacock

73. _____ has divided crowd into homogeneous and heterogeneous

a. Biumer
b. Le Bon
c. Lepoid
d. Miller

74. Right to Information Act was enacted in the year

a. 2000
b. 2005
c. 2002
d. 1999

75. _____ is the term used to refer the relationship between human beings and their physical environment

a. Human Physiology
b. Human Ecology
c. Human Environment
d. None of these

76. Who has given the concept of Urban Fringe
   a. M.N. Srinivas
   b. K.M. Kapada
   c. S.C. Dube
   d. None of these

77. Unlike village community, Urban Society lacks in
   a. Secondary social control
   b. Social tolerance
   c. Self sufficiency
   d. All the above

78. Which service provide nutrition for the children?
   a. ICDS
   b. ICMR
   c. MCH
   d. CGHS

79. Self Help Group (SHGs) involve in
   a. Family Counseling
   b. Women Upliftment and Welfare
   c. School Education
   d. Rural Development

80. Factors indicating urbanization are
   a. Migration
   b. High Congestion
   c. Slum
   d. All the above

81. When due to the attraction of new opportunities people migrate to the town it is known as
   a. Push factor of migration
   b. Pull factor of migration
   c. Poverty
   d. None of the above

82. Public Interest Litigation refers to
   a. Mechanism to provide justice out of the court
   b. To provide speedy justice
   c. To provide justice to poor, needy and weaker section of society
   d. None of the above

83. Who among the following were the intellectual foundation head of conflict theories
   a. G.H. Mead and Erving Goffman
   b. Karl Marx and Max Weber
   c. Emile Durkheim and Herbert Spencer
   d. Edward Wilson and Charles Darwin

84. Religion, Marriage, Family, Caste are example of
   a. Social Values
   b. Social institutions
   c. Social norms
   d. Social segmental division of society

85. Land is a
   a. Natural Resource
   b. Intangible and Immobile
   c. Social and Physical entity
   d. None of the above

86. Which is the first smart city in India:
   a. Ahmedabad
   b. Pune
   c. Jaipur
   d. Surat

87. The cost of localization and urbanization are together called as:
   a. External diseconomies
   b. Internal diseconomies
   c. External economies
   d. Internal economies

88. What is the cause for land degradation in Punjab?
   a. Intensive cultivation
   b. Over cultivation
   c. Deforestation
   d. Over grazing

89. Which of the following statement related to the regional planning?
   a. Development of various sectors of the economy
   b. Area specific approach to development
   c. Area difference in transport network
   d. Development of rural area.

90. Which of the following is non-base sector?
   a. Transportation
   b. Construction
   c. Communication
   d. Manufacturing

91. Which of the following is non-renewable source of energy?
   a. Hydel
   b. Themal
   c. Solar
   d. Wind power

92. Which of the following is not a variable to identify economic base of the local economy?
   a. Exports
   b. Imports
   c. Income
   d. Employment

93. Planning Commission of India was constituted in the year
   a. 1942
   b. 1947
   c. 1950
   d. 1955

94. How many Five Year plans are launched in India since Independence?
   a. 11
   b. 12
   c. 13
   d. 14

95. Establishes the principle that energy can be neither created nor destroyed
   a. Pigovian
   b. Coase Theorem
   c. Law of thermo dynamics
   d. Existence value

96. Asia's first EPZ was started in India in the year

a. 1965
b. 1972
c. 1980
d. 2000

97. Which kinds of cities attract the largest number of immigrants from foreign countries?

a. Principal metropolitans
b. Tourist centers
c. Regional centers
d. Smaller cities

98. MEPZ – special economic zone is located in

a. Chennai
b. Mumbai
c. Noida
d. Cochin

99. The overall aim of economic planning in India is

a. To increase industrial output
b. To increase in National Income
c. To generate rural employment
d. Growth with justice

100. The concept of mixed economy relates to the coexistence of

a. Rural sector and urban sector
b. Public sector and Private sector
c. Small scale sector and large scale sector
d. Service sector and Manufacturing sector

101. Statement A : NGOs need to make the State more accountable and sensitive to the needs of the Poor

Statement B : NGOs should replace the State in promoting development

a. A and B are true
b. A and B are not true
c. A is true but B is not true
d. A is not true but B is true.

102. The Horizon year for Sustainable Development Goals is:

a. 2023
b. 2026
c. 2030
d. 2040

103. What are the main factors included for assessing the Human Development Index?

a. Health
b. Education
c. Standard of living
d. All of the above

104. What is common to Article 14, 15, 21A and 24? All these articles pertain to:

a. Women
b. Children
c. Refuges
d. Minorities

105. The National Disaster Management Authority was set in the year
   a. 2001
   b. 2003
   c. 2005
   d. 2010

106. The Arya Samaj Movement 1875 propagated:
   a. Abolition of Caste system
   b. Abolition of Child Marriage
   c. Equal Rights of Men and Women
   d. All of the above

107. What is Micro Finance Loan?
   a. Small loan
   b. Medium size loans
   c. Higher loans
   d. RBI loan

108. Health is "A state of complete Physical, Mental and Social well-being and Not merely an absence of any disease or infirmity." This definition of Health is given by:
   a. International Red Cross Society
   b. Ministry of Health, Government of India
   c. World Health Organisation
   d. Voluntary Health Association of India

109. Greta Thunberg is an Activist for:
   a. Poverty concerns
   b. Social Concerns
   c. Environment Concerns
   d. Gender Concerns

110. Which Model of Social Work encourages Social Workers to see more than one cause and to find out more than one solution for a given problem?
   a. Radical Social Work
   b. Liberal Social Work
   c. Therapeutic Social Work
   d. Constructive Social Work

111. Which of these are not true of Community Organisation?
   a. Community Organisation is not a means but an end
   b. Basic needs and not felt needs of the community are important
   c. Community should be helped to help themselves
   d. All sections of the community needs to be involved in the process

112. What is the important Connectivity included in Dr. A. P. J. Abdul Kalam's PURA?
   a. Infrastructure Connectivity
   b. Digital Connectivity
   c. Knowledge Connectivity
   d. Economic Connectivity

113. SARS means:
   a. Serious Acute Refractive Syndrome
   b. Severe Acute Refractive Syndrome
   c. Severe Arteries and Renal Syndrome
   d. Severe Acute Respiratory Syndrome

114. Which of these are objectives of Self Help Groups?
   a. Promoting Empowerment
   b. Promoting Self Employment as anti-poverty agenda
   c. Promoting Leadership Qualities
   d. All of the above

115. Which of these are true of the Asset Based Community Development (ABCD) approach?
   a. Appreciating and Mobilising Individual and Community Talents, Skills and Assets
   b. Community Driven Development rather than Development driven by external agencies
   c. The recognition of Social Capital and its importance as an asset
   d. Empowering local community groups to be vehicles of Social Change

PART III

25 — TEXTILE TECHNOLOGY

(Answer ALL questions)

56. Glass transition temperature is explained by
    a. Ficke's law
    b. Free volume theory
    c. Hooks law
    d. Amonton's law

57. Which one of the following fibre is closest to wool like?
    a. PET
    b. Nylon 66
    c. Acrylic
    d. Polypropylene

58. In X ray diffraction study, the broadening of spots arcs shows a
    a. decrease in the degree of orientation
    b. increase in degree of orientation
    c. decrease in space between molecular chain
    d. increase in space between molecular chain

59. In a fibre, the dimensions of the crystalline regions are
    a. 100 times less than the length of the molecules
    b. 1000 times less than the length of the molecules
    c. 10 times less than the length of the molecules
    d. 10000 times less than the length of the molecules

60. An Unknown fibre on treatment with lead acetate forms lead sulphide. Identify the fibre.
    a. Wool
    b. Silk
    c. Flax
    d. Jute

61. Chemical depolymerisation is more suitable for
    a. Condensation Polymerisation
    b. Addition polymerisation
    c. Interfacial polymerisation
    d. Solid state polymerization

62. Poor drawing in polypropylene results in _____ crystal structure
    a. α
    b. γ
    c. Pseudo hexagonal
    d. Smectic

63. False twist texturising is not done for
    a. Polypropylene
    b. Polyester
    c. Nylon
    d. Acrylic

64. The most preferred fiber for tooth brush is
    a. Nylon 6
    b. Nylon 6,6
    c. Nylon 6,10
    d. Nylon 6,12

65. The fiber that is prone to fibrillation due to poor lateral cohesion is
   a. Polypropylene
   b. Nylon 6, 6
   c. Poly ethylene
   d. Nylon 6, 10

66. Accessibility in a cellulosic fibre defines to
   a. The availability of internal surfaces, volumes or OH groups
   b. The ratio of crystalline and amorphous region
   c. Orientation of molecular chain
   d. Lateral bond intensity of fibre

67. With respect to fibre structure, spherulite is a
   a. Molecular configuration
   b. Orientation of fibre polymer chain
   c. Structural degradation nature of a fibre
   d. Thermal transition

68. In the carding machine, draft of less than one occurs in between
   a. Feed roller and licker-in
   b. Licker-in and cylinder
   c. Cylinder and doffer
   d. Doffer and stripping roller

69. The centrifugal force (N) acting on a material mass 2g present at the tip of a beater of radius 25 cm rotating at 600 rpm is
   a. $0.1\ \pi^2$
   b. $0.2\ \pi^2$
   c. $0.005\ \pi$
   d. $0.05\ \pi^2$

70. Cleaning efficiency of blow room is 60%. The trash present in the cotton fed to the blow room is 5% and the trash present in the sliver of card is 0.2%. The cleaning efficiency of card is
   a. 36%
   b. 64%
   c. 90%
   d. 96%

71. Which one of the following is not the cause for slub in the yarn?
   a. Damaged front top roller
   b. Worn out, punctured bottom apron
   c. Worn out, punctured top apron
   d. Eccentric front bottom roller of the drafting system of ring frame

72. The number of fibres in cross section of comber lap for achieving best combing should be about
   a. 50,000
   b. 80,000
   c. 5,00,000
   d. 8,00,000

73. The comber noil index in the comber determines the distance between
   a. Top comb and tip of the wires of combing cylinder
   b. Tip of the wires of combing cylinder and bottom nipper plate
   c. Nipping point of back detaching rollers and tip of the wires of combing cylinder
   d. Nipping points of nipper plates and back detaching rollers

74. Maximum soft waste and hard waste are generated at _____ and _____ respectively
   a. Ring frame, winding machine
   b. Roving frame, winding machine
   c. Ring frame, ring frame
   d. Roving frame, ring frame

75. Which one of the following has higher neps removal efficiency?
   a. Blowroom machinery
   b. Carding machine
   c. Both blow room and carding machine
   d. Ring frame

76. Narrower rotor groove produce
   a. Soft yarn
   b. Low strength yarn
   c. Stronger yarn
   d. High hairy yarn

77. In the rotor spinning machine, maximum draft occurs between
   a. Sliver feed and fibre collecting groove
   b. Rotor groove and draw off nozzle
   c. Draw off nozzle and take off roller
   d. Rotor groove and take off roller

78. Which one of the following is adhesive process of producing yarn?
   a. Plyfil
   b. Parafil
   c. Repco
   d. Twilo

79. Which one of the following spinning systems is odd with respect to form of feed?
   a. Rotor
   b. Two nozzle airjet
   c. Ring
   d. DREF 2000

80. _____ is the spindle of 10 cm diameter cheese package having winding rate 220 m/min.
   a. 7 rpm
   b. 70 rpm
   c. 700 rpm
   d. 7000 rpm

81. The net winding rate of a 'x' diameter cheese package is expressed as
   a. $V_t/\sin\theta$
   b. $V_t/\cos\theta$
   c. $V_t \times \sin\theta$
   d. $V_t \times \cos\theta$

82. In a precision cheese winding machine the traverse ratio was found to be 5/2. In this case the number of diamonds across the circumference of the package is
   a. 2
   b. 2.5
   c. 5
   d. 7

83. In winding cylindrical packages, the term 'revolution gain' is calculated by
   a. Linear gain / package circumference
   b. Linear gain / package diameter
   c. Linear gain / package speed
   d. Linear gain / yarn traverse speed

84. In cone winding machine, the yarn is entering into a disc type tensioner with the input tension of 50mN. The tensioner adds 50mN tension in the yarn. Calculate the final tension in the yarn while leaving the disc type tensioner.
   a. 60 mN
   b. 70 mN
   c. 80 mN
   d. 100 mN

85. In which of the following shedding principle all the warp threads are unnecessarily strained during the weaving process?
   a. Open shed
   b. Semi open shed
   c. Centre closed shed
   d. Bottom closed shed

86. The introduction of float stitches in the knitted fabric will _____
   a. Increase the thickness of the fabric
   b. Increase the width of the fabric
   c. Reduce the thickness of the fabric
   d. Increase the elongation of the fabric

87. In a picking mechanism of plain loom, the power for picking
   a. Increases linearly with the mass of the shuttle
   b. Decreases proportionately with the square of loom width
   c. Decreases linearly with the mass of the shuttle
   d. Increases proportionately with the square root of loom width

88. The angle position of the pattern wheel with respect to the cylinder is
   a. 30 degree
   b. 45 degree
   c. 35 degree
   d. 50 degree

89. When entering the shed, a shuttle has a speed of 16m/s. If the retardation during its passage through the shed is 1.0m/s² and the time for the shuttle passage is 0.1m/s, find out the speed of the shuttle as it leaves the shed
   a. 15.1 m/s
   b. 15.9 m/s
   c. 16.0 m/s
   d. 16.1 m/s

90. Weft transfer takes place in _____ machine
   a. Automatic shuttle weaving
   b. Projectile weaving
   c. Air-jet weaving
   d. Rapier weaving

91. The force released by the picking stick in Projectile loom depends on
   a. Loom speed
   b. Projectile mass
   c. Torsion bar adjustment
   d. Mass of the cam

92. Copper Number is used to estimate the _____ groups in the bleached fabrics
   a. Aldehyde
   b. Acidic
   c. Amino
   d. Azo

93. _____ dyes are more prone to gas fading
   a. reactive dyes
   b. disperse dyes
   c. acid dyes
   d. vat dyes

94. The fluorescent whitening agents absorb light in
   a. UV region
   b. Visible region
   c. Infra red region
   d. Microwave region

95. Mercerization of the cotton fabric
a. Increases its dyeability
b. Decrease the solubility of the fibers in subsequent washing
c. Reduces its dyeability
d. Reduces its luster

96. Acid dyes are called so because
a. They are soluble in acids
b. They are acids
c. They dye protein fibers
d. They possess hydroxyl groups

97. Pigment Printing
a. Can be done onto only cellulosic fabric
b. Needs a binder
c. Uses Starch for thickening
d. Needs an oxidsing environment

98. Which one of the following is bridging group in reactive dye?
a. Bromo
b. Chloro
c. Azo
d. Imino

99. Printing thickeners are examples for
a. Shear thinning
b. Shear thickening
c. Bingham Solids
d. Newtonian fluids

100. Souring is used to
a. Neutralize the pH of the fabric
b. Increase the absorbance and transmittance
c. Increase the absorption of water
d. Increase the absorption of oleophilic solvents

101. The action of hydrogen peroxide bleaching agent is less rapid at
a. pH = 3.5
b. pH = 7.5
c. pH = 8.5
d. pH = 9.5

102. The thickener least preferred for printing with reactive dyeing is
a. Starch
b. CMC
c. Sodium alginate
d. Guar gum

103. Washing fastness is poor for _____ dyed fabrics.
a. Reactive
b. Sulphur
c. Direct
d. Disperse

104. If the weight of a sample of cotton decreases from 107.5 to 100 grams when heated at 105 °C for 2 hours. The Moisture Content and Regain is
a. 7.0 and 7.5
b. 8.0 and 8.5
c. 9.0 and 9.5
d. 8.5 and 9.0

105. During length measurement on fibrograph 2.5% span length was found to be 25 mm. It means
a. 2.5% of fibers clamped are not in 25 mm length
b. 2.5% of fibers clamped are longer than 25 mm in length
c. 2.5% of fibers clamped are 25 mm longer
d. 2.5% of fibers clamped are less than 25 mm

106. A fiber specimen of 200 mm extended by 10 % when loaded with 500 CN force. The length of the specimen after removal of load was found to be 202 mm. The percentage elastic recovery of the specimen is

a. 70%
b. 80%
c. 92%
d. 20%

107. If 740 mature fibers and 260 immature fibers were found in a test specimen, the percent maturity would be

a. 78
b. 74
c. 72
d. 26

108. In visual examination method of yarn grading, for the yarn number of 32 to 65, the number of wraps per inch will be

a. 16
b. 20
c. 26
d. 38

109. The conversion factor used to convert from Denier to English Worsted Count is

a. 7972/denier
b. 5315/denier
c. 4500/denier
d. 590.5/denier

110. Calculate the twist angle of a spun cotton yarn twisted to give a twist factor of 5

a. 29° 18'
b. 35° 18'
c. 32° 18'
d. 37° 18'

111. On Classimat the objectionable faults are

a. A4, B4, C4, D4
b. B3, B4, D3, D4
c. C3, C4, D3, D4
d. A4, B4, C3, C4, D3, D4

112. The mass of 500 meters of cotton yarn is 25 grains. Calculate its count in French Cotton System

a. 10^s Ne
b. 15^s Ne
c. 13^s Ne
d. 20^s Ne

113. The sample size for measuring the tensile strength of fabric in KES-FB system is

a. 5 cm × 20 cm
b. 6 cm × 20 cm
c. 5 cm × 36 cm
d. 6 cm × 36 cm

114. A water drop with a contact angle ———— is hydrophobic.

a. above 90°
b. below 90°
c. below 75°
d. above 150°

115. A fabric roll of 120 yard long and 48 inches wide contain the following defects 2 defects upto 3 inch, 5 defects over 3 inch but less than 6 inch, 1 defect over 6 inch but less than 9 inch, 1 defect over 9 inch. The defect points/100 yd^2 is given by

a. 11.9
b. 10
c. 15.3
d. 7