

NG 24 (GROUP B)

PART I — ENGINEERING MATHEMATICS

(Common to all Candidates)

(Answer ALL questions)

1. If A is a 3×3 matrix and determinant of A is 6, then find the value of the determinant of the matrix $(2A)^{-1}$
 - a. $\frac{1}{12}$
 - b. $\frac{1}{24}$
 - c. $\frac{1}{36}$
 - d. $\frac{1}{48}$

2. If $3x + 2y + z = 0$, $x + 4y + z = 0$, $2x + y + 4z = 0$, be a system of equations, then
 - a. it is inconsistent
 - b. it has only the trivial solution $x = 0, y = 0, z = 0$
 - c. it can be reduced to a single equation and so a solution does not exist
 - d. the determinant of the matrix of coefficients is zero

3. Let $M = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$. The maximum number of linearly independent eigen vectors of M is
 - a. 0
 - b. 1
 - c. 2
 - d. 3

4. The shortest and longest distance from the point $(1, 2, -1)$ to the sphere $x^2 + y^2 + z^2 = 24$ is
 - a. $(\sqrt{14}, \sqrt{46})$
 - b. $(14, 46)$
 - c. $(\sqrt{24}, \sqrt{56})$
 - d. $(24, 56)$

5. The solution of the given ordinary differential equation $x \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ is
 - a. $y = A \log x + B$
 - b. $y = Ae^{\log x} + Bx + C$
 - c. $y = Ae^x + B \log x + C$
 - d. $y = Ae^x + Bx^2 + C$

6. The complete integral of the partial differential equation $pz^2 \sin^2 x + qz^2 \cos^2 y = 1$ is
 - a. $z = 3a \cot x + (1 - a) \tan y + b$
 - b. $z^2 = 3a^2 \cot x + 3(1 + a) \tan y + b$
 - c. $z^3 = -3a \cot x + 3(1 - a) \tan y + b$
 - d. $z^4 = 2a^2 \cot x + (1 + a)(1 - a) \tan y + b$

7. The area between the parabolas $y^2 = 4 - x$ and $y^2 = x$ is given by
- $\frac{3\sqrt{2}}{16}$
 - $\frac{16\sqrt{3}}{5}$
 - $\frac{5\sqrt{3}}{16}$
 - $\frac{16\sqrt{2}}{3}$
8. The value of the integral $\int_0^a \int_0^b \int_0^c e^{x+y+z} dz dy dx$ is
- e^{a+b+c}
 - $e^a + e^b + e^c$
 - $(e^a - 1)(e^b - 1)(e^c - 1)$
 - e^{abc}
9. If $\nabla\phi = 2xyz^3 \vec{i} + x^2z^3 \vec{j} + 3x^2yz^2 \vec{k}$, then $\phi(x, y, z) =$
- $\phi = xyz^2 + c$
 - $\phi = x^3yz^2 + c$
 - $\phi = x^2yz^3 + c$
 - $\phi = x^3yz + c$
10. The only function from the following that is analytic is
- $F(z) = \operatorname{Re}(z)$
 - $F(z) = \operatorname{Im}(z)$
 - $F(z) = z$
 - $F(z) = \sin z$
11. The value of m so that $2x - x^2 + my^2$ may be harmonic is
- 0
 - 1
 - 2
 - 3
12. The value of $\int_C \frac{1}{z} dz$, where C is the circle $z = e^{i\theta}$, $0 \leq \theta \leq \pi$ is,
- πi
 - $-\pi i$
 - $2\pi i$
 - 0
13. The Region of convergence of the signal $x(n) = \delta(n - k)$, $k > 0$ is
- $z = \infty$
 - $z = 0$
 - Entire z -plane, except at $z = 0$
 - Entire z -plane, except at $z = \infty$

14. The Laplace transform of a signal $X(t)$ is $\frac{4s+1}{s^2+6s+3}$. The initial value $X(0)$ is
- 0
 - 4
 - 1/6
 - 4/3
15. Given the inverse Fourier transform of $f(s) = \begin{cases} a-|s|, & |s| \leq a \\ 0, & |s| > a \end{cases}$ is $\frac{a^2}{2\pi} \left[\frac{\sin \frac{ax}{2}}{\frac{ax}{2}} \right]^2$. The value of $\int_0^{\infty} \left[\frac{\sin x}{2} \right]^2 dx$ is
- π
 - $\frac{2\pi}{3}$
 - $\frac{\pi}{2}$
 - $\frac{\pi}{4}$
16. If $A = [a_{ij}]$ is the coefficient matrix for a system of algebraic equations, then a sufficient condition for convergence of Gauss-Seidel iteration method is
- A is strictly diagonally dominant
 - $|a_{ii}| = 1$
 - $\det(A) \neq 0$
 - $\det(A) > 0$
17. Which of the following formula is used to fit a polynomial for interpolation with equally spaced data?
- Newton's divided difference interpolation formula
 - Lagrange's interpolation formula
 - Newton's forward interpolation formula
 - Least-square formula
18. For applying Simpson's $\frac{1}{3}$ rule, the given interval must be divided into how many number of sub-intervals?
- odd
 - two
 - even
 - three
19. A discrete random variable X has the probability mass function given by $p(x) = cx$, $x = 1, 2, 3, 4, 5$. The value of the constant 'c' is
- 1/5
 - 1/10
 - 1/15
 - 1/20
20. For a Binomial distribution with mean 4 and variance 2, the value of 'n' is
- 2
 - 4
 - 6
 - 8

PART II — BASIC ENGINEERING AND SCIENCES

(Common to all candidates)

(Answer ALL questions)

21. Speed of the processor chip is measured in
- Mbps
 - GHz
 - Bits per second
 - Bytes per second
22. A program that converts Source Code into machine code is called
- Assembler
 - Loader
 - Compiler
 - Converter
23. What is the full form of URL?
- Uniform Resource Locator
 - Unicode Random Locator
 - Unified Real Locator
 - Uniform Read Locator
24. Which of the following can adsorb larger volume of hydrogen gas?
- Finely divided platinum
 - Colloidal solution of palladium
 - Small pieces of palladium
 - A single metal surface of platinum
25. What are the factors that determine an effective collision?
- Collision frequency, threshold energy and proper orientation
 - Translational collision and energy of activation
 - Proper orientation and steric bulk of the molecule
 - Threshold energy and proper orientation
26. Which one of the following flows in the internal circuit of a galvanic cell?
- atoms
 - electrons
 - electricity
 - ions
27. Which one of the following is not a primary fuel?
- petroleum
 - natural gas
 - kerosene
 - coal
28. Which of the following molecules will not display an infrared spectrum?
- CO₂
 - N₂
 - Benzene
 - HCCH
29. Which one of the following behaves like an intrinsic semiconductor, at the absolute zero temperature?
- Superconductor
 - Insulator
 - n-type semiconductor
 - p-type semiconductor
30. The energy gap (eV) at 300K of the material GaAs is
- 0.36
 - 0.85
 - 1.20
 - 1.42

31. Which of the following ceramic materials will be used for spark plug insulator?
- SnO_2
 - $\alpha\text{-Al}_2\text{O}_3$
 - TiN
 - YBaCuO_7
32. In unconventional super-conductivity, the pairing interaction is
- non-phononic
 - phononic
 - photonic
 - non-excitonic
33. What is the magnetic susceptibility of an ideal super conductor?
- 1
 - 1
 - 0
 - infinite
34. The Rayleigh scattering loss, which varies as _____ in a silica fiber.
- λ^0
 - λ^{-2}
 - λ^{-4}
 - λ^{-6}
35. What is the near field length N that can be calculated from the relation (if D is the diameter of the transducer and λ is the wavelength of sound in the material)?
- $D^2 / 2\lambda$
 - $D^2 / 4\lambda$
 - $2D^2 / \lambda$
 - $4D^2 / \lambda$
36. Which one of the following represents open thermodynamic system?
- Manual ice cream freezer
 - Centrifugal pump
 - Pressure cooker
 - Bomb calorimeter
37. In a new temperature scale say $^\circ\rho$, the boiling and freezing points of water at one atmosphere are $100^\circ\rho$ and $300^\circ\rho$ respectively. Correlate this scale with the Centigrade scale. The reading of $0^\circ\rho$ on the Centigrade scale is:
- 0°C
 - 50°C
 - 100°C
 - 150°C
38. Which of the cross-section of the beam subjected to bending moment is more economical?
- Rectangular cross-section
 - I - cross-section
 - Circular cross-section
 - Triangular cross-section
39. The velocity of a particle is given by $V = 4t^3 - 5t^2$. When does the acceleration of the particle becomes zero?
- 8.33 s
 - 0.833 s
 - 0.0833 s
 - 1 s
40. What will happen if the frequency of power supply in a pure capacitor is doubled?
- The current will also be doubled
 - The current will reduce to half
 - The current will remain the same
 - The current will increase to four-fold

PART III

13 – FOOD TECHNOLOGY

(Answer ALL questions)

41. Tetany is caused by deficiency of
- Zinc
 - Selenium
 - Copper
 - Calcium
42. Which of the followings are considered as micronutrients?
- Vitamins and water
 - Mineral and protein
 - Vitamins and mineral
 - Protein and lipids
43. Excess intake of food rich in phytic acid reduces absorption of
- Folic acid
 - Protein
 - Vitamin D
 - Minerals
44. Chelating agents are used to reduce enzymatic browning of food because it reduces availability of the following cofactor
- Iron
 - Copper
 - Zinc
 - Calcium
45. Which one of the following lipid molecules exhibit emulsification property?
- Lecithin
 - Unsaturated fatty acids
 - Steroids
 - Sphingosine
46. What is the most important fatty acid for development of brain and function?
- Linoleic acid
 - Stearic acids
 - Palmitic acid
 - Docosahexaenoic acid
47. The method of evaluating the quality of a protein is
- PDCAAS
 - PDDAC
 - PAADS
 - PCAAS
48. Hemicellulose is an example for
- Low calorie sweetener
 - Artificial sweetener
 - Homopolysaccharide
 - Heteropolysaccharide
49. Which one of the following is not the application of starch in food preparation?
- Thickener
 - Shortening agent
 - Gelling agent
 - Bulking agent
50. Low protein diet is recommended for people with following condition
- Marasmus
 - Immunodeficiency
 - Renal failure
 - Kwashiorkor

51. Which one of the following is not true about the naturally occurring colours?
- Mostly stable at extreme condition during food processing
 - It can be isolated from plants
 - It can exhibit antioxidant activity
 - Also called as pigment
52. Which of the following methods is used to measure the water content of food?
- Formol titration
 - Zak's method
 - Polarimetry
 - Karl Fischer titration
53. Which of the following is processing contaminants?
- Mycotoxins
 - Aflatoxins
 - Nitrosamines
 - Scombrotxin
54. Which of the following is a Intrinsic Parameters that affects microbial Growth?
- Temperature
 - Water activity
 - Time
 - Atmospheric conditions
55. Proximate analysis of major components in food generally does not include
- Amino acid composition
 - Fat
 - Carbohydrates
 - Protein
56. What is the main type of micro-organism responsible for food poisoning?
- Bacteria
 - Mould
 - Virus
 - Parasite
57. Which of the following is not a major parameter in Sensory food evaluation?
- Colour
 - Length of the fibre
 - Texture
 - Smell and taste
58. Which of the following is mandatory before HACCP certification?
- GMP
 - Risk assessment
 - ISO 9000
 - ISO 22000
59. Food business including small scale or cottage or Petty food businesses whose annual turnover does not exceed Rs 12 lakhs by default falls under the purview of
- Central Licensing Authority
 - State Licensing Authority
 - Registration Authority
 - National Certification Authority
60. Which of the following is right about Food Recall?
- Call from the food industry to the consumers to visit the industry
 - Recalling the production methods involved in a food industry by the production manager
 - Action taken by a manufacturer or distributor to protect the public from products that may cause health problems
 - Action taken to segregate the produced food inside the industry
61. CCP in HACCP stands for
- Cross contact points
 - Critical control points
 - Critical contact points
 - Critical certification points

62. The main objective of ISO 22000 is to
- Increase the employee productivity
 - Increase the employee morale
 - To certify the plant
 - To establish a food safety management system
63. Which is the main index organism to achieve complete safety of milk in pasteurization of milk?
- Mycobacterium tuberculosis*
 - Staphylococcus Aureus*
 - E. Coli.*
 - Listeria Monocytogenes*
64. "Date of manufacture" indicates the
- Date on which the food is procured
 - Date on which the food becomes the product as described
 - Date on which the food is placed in container in which it will be ultimately sold
 - Date on which it is packed
65. A standard practice _____, which restores nutrients that were lost in processing to near original levels.
- Ergonomics
 - Functional
 - Fortification
 - Enrichment
66. What is produced in a calf's stomach to help curdle milk and used in the production of cheese?
- chymosin
 - bacteriophage
 - antibiotic
 - pasteurization
67. Fruit juices are deaerated before allowed in to the pasteuriser is done in order to
- Reduce fouling of pasteuriser
 - Reduce oxidation deterioration
 - Increase the rate of heat transfer
 - Decrease the rate of heat transfer
68. Which of the following foods cannot be treated at high pressure?
- Bread
 - Meat
 - Fruit juice
 - Jam
69. Which of the following food preservation methods are suitable to reduce the loss of nutrients when preparing fruits and vegetables?
- Freezing
 - Using preservatives
 - Drying and blanching
 - All of the above
70. In freeze drying, removal of moisture is due to
- Boiling
 - Condensation
 - Sublimation
 - Pressure reduction
71. The water activity of the food product at the end of constant drying rate is
- Less than 1
 - Remains constant at 1
 - Equals to zero
 - Drops below 2

72. In high fructose corn syrup production, the enzyme used for the conversion of glucose to fructose is
- Isomerase
 - Invertase
 - Amylase
 - Epimerase
73. Unplanned crystallization of sugar in a confectioneries is called
- Winnowing
 - Panning
 - Fudging
 - Engrossing
74. What is the form of Iodine in Iodized Salt?
- I_2
 - KIO_3
 - KI
 - NaI
75. Tocopherol is an example of
- Anticaking agent
 - Flavouring agent
 - Antioxidant
 - None of the above
76. At which temperature frozen storage is generally operated?
- $-0^\circ C$
 - $-18^\circ C$
 - $-50^\circ C$
 - $-60^\circ C$
77. A solution is made by dissolving 1 kilo mole of solute in 2000 kg of solvent. The molality of the solution is
- 2
 - 1
 - 0.5
 - 1.5
78. A very dilute solution is prepared by dissolving ' x_1 ' mole of solute in ' x_2 ' mole of a solvent. The mole fraction of solute is approximately equal to
- x_1/x_2
 - x_2/x_1
 - $1-(x_1/x_2)$
 - $1/x_2$
79. The increase in the temperature of the aqueous solution will result in decrease of its
- weight % of the solute
 - mole fraction of the solute
 - molarity
 - molality
80. What percent of Ca by weight is present in $CaCO_3$?
- 40
 - 48
 - 96
 - 12
81. What is the equivalent weight of Na_2CO_3 in the reaction, represented by $Na_2CO_3+HCl \rightarrow NaHCO_3+NaCl$?
- 53
 - 5.3
 - 106
 - 10.6
82. Multistage compressors are used in industry, because they
- reduce the cost of compressor
 - reduce the size requirement
 - resemble closely to isothermal compression
 - are easy to control

83. At which of the following conditions it is easy to control. Net positive suction head (NPSH) of a centrifugal pump?
- greater than the vapour pressure of the liquid
 - less than the vapour pressure of the liquid
 - equal to the vapour pressure of the liquid
 - less than barometric pressure
84. Assuming flow to be laminar, if the diameter of the pipe is halved, then the pressure drop will
- increase
 - decrease
 - remain same
 - be quadrupled
85. Which type of pump is used for the transfer of solution of thick slurry?
- reciprocating
 - gear
 - diaphragm
 - centrifugal
86. Cavitation in a pump creates so many undesirable effects. Out of the following, which is not an undesirable effect created by cavitation?
- Decrease in effect
 - Increase in thrust
 - Develops noise
 - Develops high pressure
87. How the head loss in turbulent flow in a pipe varies?
- directly as the velocity
 - inversely as the square of the velocity
 - approximately as the square of the velocity
 - inversely as the square of the diameter
88. Power required by a centrifugal pump is proportional to (Where, D = diameter, N = rpm)
- N^2D^3
 - ND^2
 - N^2D
 - N^3D
89. Apples are wrapped in waxed paper to
- Prevent sunlight for changing its colour
 - Prevent aerobic respiration
 - Prevent injury
 - To make it attractive
90. Which of the following is a unique example of emulsion technology?
- Butter making
 - Ice cream preparation
 - Cream separation
 - Chips making
91. In which of the following different plastics are combined to get certain desirable properties?
- Monomers
 - Plasticizers
 - Homopolymer
 - Copolymer
92. Which of the following is a secondary refrigerant?
- NH_3
 - H_2O
 - CO_2
 - R_{12}

93. Which of the following evaporators is always kept filled with liquid refrigerant?
- Plate
 - Fin and tube
 - Flooded
 - Dry expansion
94. In ball mill, at which speed there will be centrifugation?
- Operating
 - Normal
 - Critical
 - Below normal
95. If added sugar appear first or second on food label list for a packaged food, it means
- List is in alphabetical
 - Its high in sugar
 - Its low in sugar
 - Position on the list is arbitrary
96. Angle formed by pouring flour as heap on flat surface is known as
- Contact angle
 - Angle of repose
 - Angle of rip
 - Critical angle
97. In which of the following evaporators fruit juices can be concentrated?
- Long tube
 - High pressure
 - Falling film
 - Crude filter paper
98. Heat sensitive material's with high heat of vaporization may be economically separated using
- Liquid extraction
 - Distillation
 - Evaporation
 - Adsorption
99. Vertical screw mixers are used for mixing of
- High viscous liquids
 - Low viscous liquids
 - Moderate viscous fluids
 - Dry solids
100. Zero energy cool chambers work on the principle of _____ cooling.
- Hydro
 - Evaporative
 - Vacuum
 - Room