

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

19 — PRINTING TECHNOLOGY

(Answer ALL questions)

41. The arrangement of the visual elements is
- Composition
 - Unity
 - Harmony
 - Contrast
42. Which of the following in the screening technology that gives accurate screen angles but takes lot of computational time?
- Rational tangent Screening
 - Irrational Screening
 - FM Screening
 - Supercell Screening
43. Postscript font uses _____ to describe the characters
- Bitmap
 - Pixel data
 - Vector equations
 - Integral equations
44. Which of the following is not an advantage of FM screening?
- Higher resolution
 - Higher tonal range
 - Higher color gamut
 - Higher dot gain
45. The shifting of hue associated with inkjet printers as the chroma increases.
- Grey balance
 - Ink splitting
 - Ink hooking
 - Gray error
46. 10 points = _____ mm
- 4.2 mm
 - 6.4 mm
 - 12 mm
 - 3.5 mm
47. Which test element is not present in digital plate wedge?
- Line patches
 - Resolution patches
 - Checkerboard patches
 - Overprint patches
48. The dot shape suitable for newspaper printing is
- Round
 - Ellipse
 - Chain
 - Brick
49. The exposure given to cure both imaging and non imaging areas of a flexo plate to make it tack free
- Back exposure
 - Face exposure
 - Post exposure
 - Light finishing
50. In a servicing work, in which a technician can receive, via semi-transparent goggles, inserted information that corresponds with his view of the real thing, namely the machine to be serviced is an example of _____ technology.
- Teleportation
 - Future vision
 - Augmented Reality
 - Virtual Reality

51. Which one of the following is an ISO-standardized version of the Portable Document Format (PDF) specialized for use in the archiving and long-term preservation of electronic documents?
- PDF/D
 - PDF/T
 - PDF/X
 - PDF/A
52. Which of the following is not true under Packing and Labeling of food products?
- The label should contain the name, trade name and description of food contained in the package.
 - The name of ingredients used in the product should be listed in ascending order of their composition by weight or volume.
 - For vegetarian food, a green colour circle and square should be indicated.
 - The complete address of the manufacturer or packer should be declared.
53. In Gravure printing unit, transfer of ink is affected by
- Wetting properties of the printing substrate,
 - Viscosity of the ink,
 - Printing pressure
- Only (i) and (ii)
 - Only (i) and (iii)
 - Only (ii) and (iii)
 - All the above (i), (ii) and (iii)
54. The indirect letterpress printing is known as
- Letterset
 - Letteroffset
 - Letterprint
 - Direct letter
55. The computer feeds two signals to the engraving head, the actual image signal and the screen signal defining the _____ and _____
- Screen resolution and the angular position
 - Screen size and the linear position
 - Screen resolution and the circumferential position
 - Screen size and the curvilinear position
56. Which of the following is not the major advantage of Collotype Continuous tones that can be reproduced without screening?
- Moire free
 - High quality
 - No screen
 - Dotgain
57. Which of the following represents the number of single threads in the weave per linear centimeter?
- Mesh grading
 - Mesh opening
 - Mesh Count
 - Fabric thickness
58. In electrophotography printing, duplex printing means
- Printing double image in aside
 - Printing on both side
 - Printing Gang images
 - Printing duplex boards
59. In measuring ink trapping values of overprint patches and solid color patches, all ink densities must be measured using the
- Filter for the first color
 - Filter for the second color
 - Filter for the overprint color
 - Any filter is suitable.

60. Which is not the Spectrometer principles for measuring spectral reflectance factors?
- Flywheel diffraction principle;
 - Monochromator principle;
 - Filter wheel principle;
 - Diffraction grating principle.
61. Which of the following uses a periodic flash of light that is synchronized with the press speed, making it seem to the observer as if the web were standing still?
- Optical system
 - Stroboscope
 - Rotating mirror
 - Video camera
62. Which of the following inking unit is the “shortest” inking unit?
- Gravure
 - Flexo
 - Offset
 - All of the above
63. Match the correct pressure for the respective process
- | | |
|---------------------------|-----------------|
| (1) letterpress printing | (i) 0.1–0.5 MPa |
| (2) flexographic printing | (ii) 1.5–5 MPa |
| (3) offset printing | (iii) 0.8–2 MPa |
| (4) gravure printing | (iv) 5–15 MPa |
- (1)-(i); (2)-(ii); (3)-(iii); (4)-(iv)
 - (1)-(iv); (2)-(i); (3)-(iii); (4)-(ii)
 - (1)-(iv); (2)-(iii); (3)-(ii); (4)-(i)
 - (1)-(ii); (2)-(iv); (3)-(iii); (4)-(i)
64. The inline perfect printing, for work-and-turn needs gripper margins at
- Both lead and left edge
 - Both lead and trail edge
 - Both lead and right edge
 - Only one edge
65. The placing of a section within another section is known as
- Insetting
 - Inserting
 - Collating
 - Gathering
66. Buffer storage in mailroom system is used for
- Storing the unprinted sheets
 - Storing the printed sheets
 - Storing the materials used in printing
 - Storing the rejected newspapers
67. Hot melt adhesive is a
- Vegetable adhesive
 - Animal adhesive
 - Synthetic adhesive
 - Volatile adhesive
68. Which of the following improves the book structure by giving it a convex spine and a concave fore edge?
- Cutting
 - Rounding
 - Folding
 - Adhesive binding

69. A series of small holes very close to each other is made so that a position of the sheet of paper may be readily torn away and this operation is called
- Punching
 - Perforating
 - Drilling
 - Creasing
70. A small metal unit used to prevent a hole in paper or board from tearing out under stress is called
- Eyelets
 - Rivets
 - Cords
 - Press fasteners
71. Which of the following covers is a cover made from paper or paper fiber material with greater substance than that used for the body of the book?
- Hard cover
 - Soft cover
 - Self cover
 - Case bound cover
72. Which of the following is the type of machine used to fold thin papers?
- Knife folding machine
 - Buckle folding machine
 - Lump folding machine
 - Former folding machine
73. Which of the following is the coating technique in which the varnish is applied to only selected portion?
- Overprint varnish
 - Spot varnish
 - Foil stamping
 - Blanking
74. Tipping-in represents
- Fixing one section within another
 - Placing loose piece of paper inside a section
 - Affixing a single leaf inside a section
 - Placing loose piece of paper outside a section
75. Thin layer of coating material applied to the printed material is called
- Varnishing
 - Lamination
 - Gumming
 - Gold foiling
76. Which of the following is the package commonly used for packing tablets, capsules and electronic gadgets?
- Blister
 - Bottle
 - Container
 - Skin
77. An opening device made of plastic normally fitted to lined carton is called as
- Spouted pack
 - Tetra pack
 - Active pack
 - Intelligent pack
78. The paper based substrate is called as _____ material
- Isotropic
 - Anisotropic
 - Thixotrophy
 - None of the above
79. Which of the following packaging materials is used for packing of fruits?
- Leno bag
 - Piggy bag
 - Fishy bag
 - Birdy bag

80. VCI films are used to avoid _____ of automotive packaging
- Migration
 - Oxidation
 - Leaching
 - Corrosion
81. The process of exposing the test specimen to a standard condition is known as
- Conditioning
 - Calibrating
 - Characterizing
 - None of the above
82. The performance tests are mainly conducted to simulate the field conditions during
- Handling
 - Storage
 - Transportation
 - All the above
83. The Tin coating is measured by using
- Viscometer
 - Hygrometer
 - Elcometer
 - Luxmeter
84. Which of the following instruments is used to determine the interface of colours of glass containers during gradual cooling process?
- Polariscope
 - Microscope
 - Stethoscope
 - Stroboscope
85. Antioxidants are added to oils and fats to protect
- Leaching
 - Oxidative rancidity
 - Migration
 - Diffusion
86. How do you calculate water activity where P is vapor Pressure of food and P_0 is vapor pressure of pure water?
- $a_w \neq P/P_0$
 - $a_w = P_0/p$
 - $a_w \approx P/P_0$
 - $a_w = P/p$
87. Which of the following standards is used for drop testing of transport package?
- ASTM D4169
 - ASTM D4189
 - ASTM D1169
 - ASTM D5169
88. A corona treating system is designed to increase the _____ of plastic films
- Tensile
 - Optical value
 - Burst value
 - Surface energy
89. What is the formula to calculate Budgeted hourly rate?
- $BHR = (DDE - IDE)/DCH$
 - $BHR = (DDE - IDE) \times DCH$
 - $BHR = (DDE + IDE)/DCH$
 - $BHR = (DDE + IDE) \times DCH$
90. Absorption costing is inclusive of
- Total cost
 - Works cost
 - Variable cost
 - Fixed cost
91. Break-even point is
- Sales at which there is no profit or loss
 - Sales at which profit is high
 - Sales at which there is high overheads
 - Sales at which there is loss

92. Angle of incidence is
- Angle between sales and fixed cost lines
 - Angle between sales and variable cost lines
 - Angle between sales and total cost lines
 - Angle between fixed cost and total cost lines
93. Operating cost is calculated through
- Ledger account
 - Balance sheet
 - Profit and loss account
 - Cost sheet
94. The conversion costs is inclusive of _____ and _____
- Direct labor, overhead expenses
 - Indirect labor, overhead expenses
 - Direct material, overhead expenses
 - Indirect material, overhead expenses
95. In which of the print estimating methods, the codes are assigned for production components?
- Price line estimation
 - Price matrix estimation
 - Computerized estimation
 - Price line and matrix estimation
96. SPANKS formula can be used to calculate
- Paper quantity
 - Ink quantity
 - Glue quantity
 - Paste quantity
97. The Prime cost is comprises of
- All indirect cost
 - All direct cost
 - Direct and indirect cost
 - Specific costs
98. The selling price of the product is determined by adding
- Prime cost + profit
 - Work cost + profit
 - Cost of sales + profit
 - Overheads + profit
99. The cost of power consumption of a machinery is calculated on the basis of
- Value of machine
 - Direct wages
 - Horse power of machines
 - Number of lights
100. Hours worked \times Rate per hour is known as
- Piece rate
 - Time rate
 - Differential rate
 - Labor turnover