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. $\left(\sqrt{14}, \sqrt{46}\right)$

   b. (14, 46)

   c. $\left(\sqrt{24}, \sqrt{56}\right)$

   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

a. $\frac{3\sqrt{2}}{16}$

b. $\frac{16\sqrt{3}}{5}$

c. $\frac{5\sqrt{3}}{16}$

d. $\frac{16\sqrt{2}}{3}$

8. The value of the integral $\int_0^a \int_0^b \int_0^c e^{x+y+z}\, dz\, dy\, dx$ is

a. e^{a+b+c}

b. $e^a + e^b + e^c$

c. $\left(e^a - 1\right)\left(e^b - 1\right)\left(e^c - 1\right)$

d. e^{abc}

9. If $\nabla\phi = 2xyz^3\,\vec{i} + x^2z^3\,\vec{j} + 3x^2yz^2\,\vec{k}$, then $\phi(x, y, z) =$

a. $\phi = xyz^2 + c$

b. $\phi = x^3yz^2 + c$

c. $\phi = x^2yz^3 + c$

d. $\phi = x^3yz + c$

10. The only function from the following that is analytic is

a. $F(z) = \mathrm{Re}(z)$

b. $F(z) = \mathrm{Im}(z)$

c. $F(z) = z$

d. $F(z) = \sin z$

11. The value of m so that $2x - x^2 + my^2$ may be harmonic is

a. 0

b. 1

c. 2

d. 3

12. The value of $\int_C \frac{1}{z} dz$, where C is the circle $z = e^{i\theta}$, $0 \le \theta \le \pi$ is,

a. πi

b. $-\pi i$

c. $2\pi i$

d. 0

13. The Region of convergence of the signal $x(n) = \delta(n - k),\ k > 0$ is

a. $z = \infty$

b. $z = 0$

c. Entire z-plane, except at $z = 0$

d. 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

a. 0

b. 4

c. 1/6

d. 4/3

15. Given the inverse Fourier transform of $f(s)=\begin{cases} a-|s|, & |s|\le a \\ 0, & |s|>a \end{cases}$ 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

a. π

b. $\frac{2\pi}{3}$

c. $\frac{\pi}{2}$

d. $\frac{\pi}{4}$

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. A is strictly diagonally dominant

b. $|a_{ii}|=1$

c. $\det(A)\neq 0$

d. $\det(A)>0$

17. Which of the following formula is used to fit a polynomial for interpolation with equally spaced data?

a. Newton's divided difference interpolation formula

b. Lagrange's interpolation formula

c. Newton's forward interpolation formula

d. 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?

a. odd

b. two

c. even

d. 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

a. 1/5

b. 1/10

c. 1/15

d. 1/20

20. For a Binomial distribution with mean 4 and variance 2, the value of 'n' is

a. 2

b. 4

c. 6

d. 8

PART II — BASIC ENGINEERING AND SCIENCES

(Common to all candidates)

(Answer ALL questions)

21. Speed of the processor chip is measured in
    a. Mbps
    b. GHz
    c. Bits per second
    d. Bytes per second

22. A program that converts Source Code into machine code is called
    a. Assembler
    b. Loader
    c. Compiler
    d. Converter

23. What is the full form of URL?
    a. Uniform Resource Locator
    b. Unicode Random Locator
    c. Unified Real Locator
    d. Uniform Read Locator

24. Which of the following can adsorb larger volume of hydrogen gas?
    a. Finely divided platinum
    b. Colloidal solution of palladium
    c. Small pieces of palladium
    d. A single metal surface of platinum

25. What are the factors that determine an effective collision?
    a. Collision frequency, threshold energy and proper orientation
    b. Translational collision and energy of activation
    c. Proper orientation and steric bulk of the molecule
    d. Threshold energy and proper orientation

26. Which one of the following flows in the internal circuit of a galvanic cell?
    a. atoms
    b. electrons
    c. electricity
    d. ions

27. Which one of the following is not a primary fuel?
    a. petroleum
    b. natural gas
    c. kerosene
    d. coal

28. Which of the following molecules will not display an infrared spectrum?
    a. CO_2
    b. N_2
    c. Benzene
    d. HCCH

29. Which one of the following behaves like an intrinsic semiconductor, at the absolute zero temperature?
    a. Superconductor
    b. Insulator
    c. n-type semiconductor
    d. p-type semiconductor

30. The energy gap (eV) at 300K of the material *GaAs* is
    a. 0.36
    b. 0.85
    c. 1.20
    d. 1.42

31. Which of the following ceramic materials will be used for spark plug insulator?

a. SnO_2

b. α-Al_2O_3

c. TiN

d. $YBaCuO_7$

32. In unconventional super-conductivity, the pairing interaction is

a. non-phononic

b. phononic

c. photonic

d. non-excitonic

33. What is the magnetic susceptibility of an ideal super conductor?

a. 1

b. –1

c. 0

d. infinite

34. The Rayleigh scattering loss, which varies as _____ in a silica fiber.

a. λ^0

b. λ^{-2}

c. λ^{-4}

d. 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)?

a. $D^2 / 2\lambda$

b. $D^2 / 4\lambda$

c. $2D^2 / \lambda$

d. $4D^2 / \lambda$

36. Which one of the following represents open thermodynamic system?

a. Manual ice cream freezer

b. Centrifugal pump

c. Pressure cooker

d. Bomb calorimeter

37. In a new temperature scale say $°\rho$, the boiling and freezing points of water at one atmosphere are $100°\ \rho$ and $300°\rho$ respectively. Correlate this scale with the Centigrade scale. The reading of $0°\rho$ on the Centigrade scale is:

a. 0°C

b. 50°C

c. 100°C

d. 150°C

38. Which of the cross-section of the beam subjected to bending moment is more economical?

a. Rectangular cross-section

b. I - cross-section

c. Circular cross-section

d. 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?

a. 8.33 s

b. 0.833 s

c. 0.0833 s

d. 1 s

40. What will happen if the frequency of power supply in a pure capacitor is doubled?

a. The current will also be doubled

b. The current will reduce to half

c. The current will remain the same

d. The current will increase to four-fold

PART III

19 — PRINTING TECHNOLOGY

(Answer ALL questions)

41. The arrangement of the visual elements is
    a. Composition
    b. Unity
    c. Harmony
    d. Contrast

42. Which of the following in the screening technology that gives accurate screen angles but takes lot of computational time?
    a. Rational tangent Screening
    b. Irrational Screening
    c. FM Screening
    d. Supercell Screening

43. Postscript font uses _____ to describe the characters
    a. Bitmap
    b. Pixel data
    c. Vector equations
    d. Integral equations

44. Which of the following is not an advantage of FM screening?
    a. Higher resolution
    b. Higher tonal range
    c. Higher color gamut
    d. Higher dot gain

45. The shifting of hue associated with inkjet printers as the chroma increases.
    a. Grey balance
    b. Ink splittting
    c. Ink hooking
    d. Gray error

46. 10 points = _____ mm
    a. 4.2 mm
    b. 6.4 mm
    c. 12 mm
    d. 3.5 mm

47. Which test element is not present in digital plate wedge?
    a. Line patches
    b. Resolution patches
    c. Checkerboard patches
    d. Overprint patches

48. The dot shape suitable for newspaper printing is
    a. Round
    b. Ellipse
    c. Chain
    d. Brick

49. The exposure given to cure both imaging and non imaging areas of a flexo plate to make it tack free
    a. Back exposure
    b. Face exposure
    c. Post exposure
    d. 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.
    a. Teleportation
    b. Future vision
    c. Augmented Reality
    d. 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?

a. PDF/D
b. PDF/T
c. PDF/X
d. PDF/A

52. Which of the following is not true under Packing and Labeling of food products?

a. The label should contain the name, trade name and description of food contained in the package.
b. The name of ingredients used in the product should be listed in ascending order of their composition by weight or volume.
c. For vegetarian food, a green colour circle and square should be indicated.
d. The complete address of the manufacturer or packer should be declared.

53. In Gravure printing unit, transfer of ink is affected by

(i) Wetting properties of the printing substrate,
(ii) Viscosity of the ink,
(iii) Printing pressure

a. Only (i) and (ii)
b. Only (i) and (iii)
c. Only (ii) and (iii)
d. All the above (i), (ii) and (iii)

54. The indirect letterpress printing is known as

a. Letterset
b. Letteroffset
c. Letterprint
d. Direct letter

55. The computer feeds two signals to the engraving head, the actual image signal and the screen signal defining the ———— and ————

a. Screen resolution and the angular position
b. Screen size and the linear position
c. Screen resolution and the circumferential position
d. 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?

a. Moire free
b. High quality
c. No screen
d. Dotgain

57. Which of the following represents the number of single threads in the weave per linear centimeter?

a. Mesh grading
b. Mesh opening
c. Mesh Count
d. Fabric thickness

58. In electrophotography printing, duplex printing means

a. Printing double image in aside
b. Printing on both side
c. Printing Gang images
d. Printing duplex boards

59. In measuring ink trapping values of overprint patches and solid color patches, all ink densities must be measured using the

a. Filter for the first color
b. Filter for the second color
c. Filter for the overprint color
d. Any filter is suitable.

60. Which is not the Spectrometer principles for measuring spectral reflectance factors?

a. Flywheel diffraction principle;

b. Monochromator principle;

c. Filter wheel principle;

d. 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?

a. Optical system

b. Stroboscope

c. Rotating mirror

d. Video camera

62. Which of the following inking unit is the "shortest" inking unit?

a. Gravure

b. Flexo

c. Offset

d. 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

a. (1)-(i); (2)-(ii); (3)-(iii); (4)-(iv)

b. (1)-(iv); (2)-(i); (3)-(iii); (4)-(ii)

c. (1)-(iv); (2)-(iii); (3)-(ii); (4)-(i)

d. (1)-(ii); (2)-(iv); (3)-(iii); (4)-(i)

64. The inline perfect printing, for work-and-turn needs gripper margins at

a. Both lead and left edge

b. Both lead and trail edge

c. Both lead and right edge

d. Only one edge

65. The placing of a section within another section is known as

a. Insetting

b. Inserting

c. Collating

d. Gathering

66. Buffer storage in mailroom system is used for

a. Storing the unprinted sheets

b. Storing the printed sheets

c. Storing the materials used in printing

d. Storing the rejected newspapers

67. Hot melt adhesive is a

a. Vegetable adhesive

b. Animal adhesive

c. Synthetic adhesive

d. Volatile adhesive

68. Which of the following improves the book structure by giving it a convex spine and a concave fore edge?

a. Cutting

b. Rounding

c. Folding

d. 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
    a. Punching
    b. Perforating
    c. Drilling
    d. Creasing

70. A small metal unit used to prevent a hole in paper or board from tearing out under stress is called
    a. Eyelets
    b. Rivets
    c. Cords
    d. 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?
    a. Hard cover
    b. Soft cover
    c. Self cover
    d. Case bound cover

72. Which of the following is the type of machine used to fold thin papers?
    a. Knife folding machine
    b. Buckle folding machine
    c. Lump folding machine
    d. Former folding machine

73. Which of the following is the coating technique in which the varnish is applied to only selected portion?
    a. Overprint varnish
    b. Spot varnish
    c. Foil stamping
    d. Blanking

74. Tipping-in represents
    a. Fixing one section within another
    b. Placing loose piece of paper inside a section
    c. Affixing a single leaf inside a section
    d. Placing loose piece of paper outside a section

75. Thin layer of coating material applied to the printed material is called
    a. Varnishing
    b. Lamination
    c. Gumming
    d. Gold foiling

76. Which of the following is the package commonly used for packing tablets, capsules and electronic gadgets?
    a. Blister
    b. Bottle
    c. Container
    d. Skin

77. An opening device made of plastic normally fitted to lined carton is called as
    a. Spouted pack
    b. Tetra pack
    c. Active pack
    d. Intelligent pack

78. The paper based substrate is called as ———— material
    a. Isotropic
    b. Anisotropic
    c. Thixotrophy
    d. None of the above

79. Which of the following packaging materials is used for packing of fruits?
    a. Leno bag
    b. Piggy bag
    c. Fishy bag
    d. Birdy bag

80. VCI films are used to avoid ———— of automotive packaging
a. Migration
b. Oxidation
c. Leaching
d. Corrosion

81. The process of exposing the test specimen to a standard condition is known as
a. Conditioning
b. Calibrating
c. Characterizing
d. None of the above

82. The performance tests are mainly conducted to simulate the field conditions during
a. Handling
b. Storage
c. Transportation
d. All the above

83. The Tin coating is measured by using
a. Viscometer
b. Hygrometer
c. Elcometer
d. Luxmeter

84. Which of the following instruments is used to determine the interface of colours of glass containers during gradual cooling process?
a. Polariscope
b. Microscope
c. Stethoscope
d. Stroboscope

85. Antioxidants are added to oils and fats to protect
a. Leaching
b. Oxidative rancidity
c. Migration
d. Diffusion

86. How do you calculate water activity where P is vapor Pressure of food and P_o is vapor pressure of pure water?
a. $a_w \neq P/P_0$
b. $a_w = P_0/p$
c. $a_w \approx P/P_0$
d. $a_w = P/p$

87. Which of the following standards is used for drop testing of transport package?
a. ASTM D4169
b. ASTM D4189
c. ASTM D1169
d. ASTM D5169

88. A corona treating system is designed to increase the ———— of plastic films
a. Tensile
b. Optical value
c. Burst value
d. Surface energy

89. What is the formula to calculate Budgeted hourly rate?
a. BHR = (DDE - IDE)/DCH
b. BHR = (DDE - IDE) × DCH
c. BHR = (DDE + IDE)/DCH
d. BHR = (DDE + IDE) × DCH

90. Absorption costing is inclusive of
a. Total cost
b. Works cost
c. Variable cost
d. Fixed cost

91. Break-even point is
a. Sales at which there is no profit or loss
b. Sales at which profit is high
c. Sales at which there is high overheads
d. Sales at which there is loss

92. Angle of incidence is

a. Angle between sales and fixed cost lines

b. Angle between sales and variable cost lines

c. Angle between sales and total cost lines

d. Angle between fixed cost and total cost lines

93. Operating cost is calculated through

a. Ledger account

b. Balance sheet

c. Profit and loss account

d. Cost sheet

94. The conversion costs is inclusive of ———— and ————

a. Direct labor, overhead expenses

b. Indirect labor, overhead expenses

c. Direct material, overhead expenses

d. Indirect material, overhead expenses

95. In which of the print estimating methods, the codes are assigned for production components?

a. Price line estimation

b. Price matrix estimation

c. Computerized estimation

d. Price line and matrix estimation

96. SPANKS formula can be used to calculate

a. Paper quantity

b. Ink quantity

c. Glue quantity

d. Paste quantity

97. The Prime cost is comprises of

a. All indirect cost

b. All direct cost

c. Direct and indirect cost

d. Specific costs

98. The selling price of the product is determined by adding

a. Prime cost + profit

b. Work cost + profit

c. Cost of sales + profit

d. Overheads + profit

99. The cost of power consumption of a machinery is calculated on the basis of

a. Value of machine

b. Direct wages

c. Horse power of machines

d. Number of lights

100. Hours worked × Rate per hour is known as

a. Piece rate

b. Time rate

c. Differential rate

d. Labor turnover

———————