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 $^\circ\rho$, 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:

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

21 — TEXTILE TECHNOLOGY

(Answer ALL questions)

41. The glass transition temperature of polyester is
    a. 80°C
    b. 100°C
    c. 210°C
    d. 230°C

42. Which one of the following spinning system gives higher production rate?
    a. Melt spinning
    b. Dry spinning
    c. Wet spinning
    d. Spin drawing

43. Silk is a
    a. Homo polymer
    b. Random copolymer
    c. Block copolymer
    d. Alternating copolymer

44. The density of polypropylene is
    a. 1.14 g/cc
    b. 1.38 g/cc
    c. 0.92 g/cc
    d. 1.52 g/cc

45. The amount of recommended water (by weight) in dried poly (ethylene terephthalate) chips suitable for melt spinning is in the range of
    a. Approximately 1%
    b. 0.1 to 0.4%
    c. 0.04 to 0.06%
    d. 0.001 to 0.005%

46. Which one of the following is a regenerated protein fibre?
    a. Viscose
    b. Casein
    c. Cuprammonium rayon
    d. Cellulose acetate

47. The crystallinity percentage of silk is
    a. Higher than cotton but lower than wool
    b. Higher than wool
    c. Lower than cotton but higher than wool
    d. Lower than cotton and wool

48. The fibre which is having negative birefringence value is
    a. Cotton
    b. Nylon
    c. Silk
    d. Acrylic

49. The density of polyester fibre is
    a. Greater than cotton
    b. Less than cotton but greater than wool
    c. Less than nylon
    d. Greater than nylon but less than polyethylene

50. The moisture regain of nylon is
    a. Greater than wool
    b. Less than PP
    c. Greater than cotton
    d. Less than cotton but greater than polyester

51. Convolution count of a cotton fibre is defined as

a. Number of convolutions in a fibre

b. Number of convolution in a unit length of a fibre

c. The average density of a fibre

d. Average convolutions of a bunch of fibres

52. The number of amino acids in casein fibre is

a. 20

b. 18

c. 16

d. 14

53. Based on the principle of yarn formation, select the odd one among the following.

a. Rotor spinning

b. DREF 2 spinning

c. Electrostatic spinning

d. Two nozzle Airjet spinning

54. Two yarns of count X each are doubled and plied. The ratio of resultant count of two ply yarn expressed in tex system and Ne system is ————————. Neglect contraction due to twist.

a. 4

b. 2

c. ½

d. ¼

55. The surface speed of cylinder is

a. Greater than that of licker in

b. Lesser than that of licker in

c. Lesser than that of doffer

d. Greater than that of doffer but lesser than licker in

56. The winding tension at the ring frame will be highest during winding at

a. Empty portion of cop bottom

b. Empty portion of cop tip

c. Full diameter portion of cop tip

d. Full diameter portion of cop bottom

57. The number of fibres in the cross section of comber lap for best combing should be about

a. 50,000

b. 1,00,000

c. 5,00,000

d. 8,00,000

58. In the carding machine, the closest setting exists between

a. Cylinder and licker-in

b. Cylinder and flat

c. Cylinder and doffer

d. Feed plate and licker-in

59. In cotton spinning, at the ring frame, the shore hardness of front top roller is normally

a. Higher than that of back roller

b. Higher than that of middle roller

c. Lesser than that of back roller

d. Equal to that of back roller

60. Select the correct match

I	Core sheath yarn	(i)	Rotor yarn
II	Back doubling	(ii)	DREF yarn
III	Wrapped bundle of straight fibres	(iii)	Condensed spun yarn
IV	Reduced spinning triangle	(iv)	Two nozzle air jet yarn

a. I-ii, II-i, III-iii, IV-iv

b. I-i, II-ii, III-iii, IV-iv

c. I-i II-ii, III-iv, IV-iii

d. I-ii, II-i, III-iv, IV-iii

61. The trash content of cotton fed to the blow room is 5%. The blow room has three machines having individual cleaning efficiency of 25%, 30%, 25% respectively. Find the trash% present in the blow room lap.

a. 1.97 %

b. 1.00%

c. 0.09%

d. 2.53%

62. The gear A of 20 teeth meshes with gear B of 10 teeth that is compounded to wheel C of 30 teeth that meshes with gear D of 10 teeth. The velocity ratio between gear D and gear A is

a. 3

b. 5

c. 4

d. 6

63. 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. 0.005π

d. $0.05\ \pi^2$

64. The trash removal is higher at

a. Blow room

b. Ring frame

c. Roving frame

d. Cone winder

65. A reed has 15 dents/cm, and the warp is drawn in two ends per dent. If the finished fabric is 1.4 m wide compared with 1.47 m wide in the reed, what is the finished fabric sett?

a. 26

b. 28

c. 32

d. 35

66. Among the following systems of drafting, the objective of which is to reduce the friction between adjacent warp ends?

a. Point

b. Sateen

c. Herring-bone

d. Reversed

67. The contraction percentage of 1 x 1 rib structure compared to its machine width is around

a. 30

b. 40

c. 50

d. 60

68. What will be the loop length of the knitted fabric having course length 60 cm and wale length 80 cm and number of loops per course 40?

a. 0.75 cm

b. 1.5 cm

c. 2 cm

d. 3.5 cm

69. What will be the tightness factor of the plain single jersey knitted with 64 tex yarn and 1.5 cm loop length?

a. 96

b. 42

c. 5.3

d. 2.3

70. In Rib Knitting machine, the Knittable yarn count in 'Ne' is calculated by

a. $\frac{gauge}{8.4}$

b. $\frac{(gauge)^2}{8.4}$

c. $\frac{gauge}{9.6}$

d. $\frac{(gauge)^2}{9.6}$

71. In Weft knitting machine, the term 'Robbing back' is

a. Transfer of loop from one needle to another needle

b. Feeding of two yarn in one feeder

c. Pulling of few length of yarn from newly formed loop

d. Pulling of few length of yarn from already formed loop

72. Which of the following Thermal techniques utilizes the mechanical hammering for conversion of vibration energy to heat energy for bonding the fibrous web?

a. Area

b. Through air

c. Belt

d. Ultrasonic

73. Which of the following fibers can be used for manufacturing of absorbent core based nonwoven products?

a. Viscose

b. Linen

c. Jute

d. Hemp

74. In which of the following web laying techniques, high loft structures can be produced?

a. Polymer laid

b. Card laid

c. Water laid

d. Air laid

75. The temperature of the air in melt blown process is set close to _____ of the polymer.

a. Glass transition temperature

b. Melting temperature

c. Crystallisation temperature

d. Cryogenic temperature

76. Which of the following Mechanical finishings is adopted to improve the lusture of bonded fabric?

a. Creping

b. Polishing

c. Raising

d. Emerising

77. A mill spinning 40^s Ne carded yarn with the following fiber properties. Find the Fiber Quality Index?

2.5% S.L = 28 mm

Uniformity ratio = 0.47

Micronaire value = 4.3

Bundle strength (g/tex) = 22.5

Maturity ratio = 0.80

a. 59

b. 55

c. 45

d. 50

78. Calculate the tenacity (g/tex) of cotton sample (at gauge length 1/8 inch) if the breaking load is 6.1 kg and the weight of the bundle is 3.9 mg obtained from the Pressley fiber strength tester?

a. 23.39

b. 25.49

c. 16.39

d. 28.19

79. If 840 mature fibers and 160 immature fibers were found in a test specimen, the percent immaturity would be

a. 16
b. 26
c. 30
d. 32

80. 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

81. If 75 km of yarn weigh 2.5 kg, the count in metric system will be

a. 30^S
b. 2.40^S
c. 10^S
d. 50^S

82. The CV % of mass irregularity of yarn generally equals U % multiplied by

a. 1.00
b. 1.25
c. 1.44
d. 1.82

83. In Yarn Evenness testing the variance length curve is more suitable for

a. Periodic faults
b. Non-periodic mass variation
c. Imperfections
d. Variation in the count

84. The U% of Single yarn is 17.3%. The expected U% of a 3 - ply yarn produced from this yarn will be

a. 5.8%
b. 10.0%
c. 12.3%
d. 17.3%

85. Crimp interchange is a phenomena associated with

a. Bursting Strength
b. Abrasion Resistance
c. Tensile Strength
d. Tear Strength

86. For spreading knitted and other stretch fabric the spreading device should include

a. Positioning devices
b. Positive feed system
c. Width Indicators
d. End treatment devices

87. The Air permeability of a fabric increases linearly with increase in twist factor. This is due to

a. The air space in the yarn is reduced
b. The warp and weft cover factor is high
c. The air space in the yarn is high
d. The warp and weft cover factor is constant

88. On a 4 point fabric grading system (ASTM D5430) when the length of the defect is more than 3.2 inches but less than 6 inches, how many demerit points are given?

a. 3 points
b. 2 points
c. 4 points
d. 1 point

89. Transfer printing is an example for
a. Direct style
b. Resist style
c. Discharge style
d. Rotary style

90. Ionic dyes used in printing is not suitable for
a. wool
b. silk
c. casein
d. polypropylene

91. Freundlich isotherm becomes Nernst isotherm when n is
a. 0.2
b. 0.5
c. 0.8
d. 1.0

92. What is the effect of Mercerization process ?
a. Decreases luster.
b. Decreases dyeability
c. Increases dyeability
d. Increases orientation of polymers

93. The enzyme preferred for desizing is
a. α-Amylase
b. ß-Amylase
c. γ-Amylase
d. Lipase

94. In case of metameric samples which one of the following will be identical?
a. Reflectance curve
b. Spectral Reflectance curve
c. ΔE values
d. Tristimulus values

95. Which of the following dyes are more prone to gas fading?
a. reactive dyes
b. disperse dyes
c. acid dyes
d. vat dyes

96. Benzotriazoles is an example for
a. Antimicrobial agent
b. UV Protective agent
c. Antistatic agent
d. Wetting agent

97. THPC flame retardant is produced by reaction of
a. Phosphine and Formaldehyde
b. Urea and Formaldehyde
c. Sulphur and Formaldehyde
d. Ammonia and Formaldehyde

98. Which of the following Dyes are used for printing of polyester?
a. Disperse Dyes
b. Reactive Dyes
c. Direct Dyes
d. Acid Dyes

99. Which one of the following chemicals is used as reducing agent in printing?
a. Sodium chlorite
b. Sodium hydrosulphite
c. Sodium nitrate
d. Sodium phosphate

100. Which one of the following fibres is mass coloured?
a. Cotton
b. Polyproylene
c. Silk
d. Wool