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

13 – FOOD TECHNOLOGY

(Answer ALL questions)

41. Tetany is caused by deficiency of
    a. Zinc
    b. Selenium
    c. Copper
    d. Calcium

42. Which of the followings are considered as micronutrients?
    a. Vitamins and water
    b. Mineral and protein
    c. Vitamins and mineral
    d. Protein and lipids

43. Excess intake of food rich in phytic acid reduces absorption of
    a. Folic acid
    b. Protein
    c. Vitamin D
    d. Minerals

44. Chelating agents are used to reduce enzymatic browning of food because it reduces availability of the following cofactor
    a. Iron
    b. Copper
    c. Zinc
    d. Calcium

45. Which one of the following lipid molecules exhibit emulsification property?
    a. Lecithin
    b. Unsaturated fatty acids
    c. Steroids
    d. Sphingosine

46. What is the most important fatty acid for development of brain and function?
    a. Linoleic acid
    b. Stearic acids
    c. Palmitic acid
    d. Docosahexaenoic acid

47. The method of evaluating the quality of a protein is
    a. PDCAAS
    b. PDDAC
    c. PAADS
    d. PCAAS

48. Hemicellulose is an example for
    a. Low calorie sweetener
    b. Artificial sweetener
    c. Homopolysaccharide
    d. Heteropolysaccharide

49. Which one of the following is not the application of starch in food preparation?
    a. Thickener
    b. Shortening agent
    c. Gelling agent
    d. Bulking agent

50. Low protein diet is recommended for people with following condition
    a. Marasmus
    b. Immunodeficiency
    c. Renal failure
    d. Kwashiorkor

51. Which one of the following is not true about the naturally occurring colours?
    a. Mostly stable at extreme condition during food processing
    b. It can be isolated from plants
    c. It can exhibit antioxidant activity
    d. Also called as pigment

52. Which of the following methods is used to measure the water content of food?
    a. Formol titration
    b. Zak's method
    c. Polarimetry
    d. Karl Fischer titration

53. Which of the following is processing contaminants?
    a. Mycotoxins
    b. Aflatoxins
    c. Nitrosamines
    d. Scombrotoxin

54. Which of the following is a Intrinsic Parameters that affects microbial Growth?
    a. Temperature
    b. Water activity
    c. Time
    d. Atmospheric conditions

55. Proximate analysis of major components in food generally does not include
    a. Amino acid composition
    b. Fat
    c. Carbohydrates
    d. Protein

56. What is the main type of micro-organism responsible for food poisoning?
    a. Bacteria
    b. Mould
    c. Virus
    d. Parasite

57. Which of the following is not a major parameter in Sensory food evaluation?
    a. Colour
    b. Length of the fibre
    c. Texture
    d. Smell and taste

58. Which of the following is mandatory before HACCP certification?
    a. GMP
    b. Risk assessment
    c. ISO 9000
    d. 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
    a. Central Licensing Authority
    b. State Licensing Authority
    c. Registration Authority
    d. National Certification Authority

60. Which of the following is right about Food Recall?
    a. Call from the food industry to the consumers to visit the industry
    b. Recalling the production methods involved in a food industry by the production manager
    c. Action taken by a manufacturer or distributor to protect the public from products that may cause health problems
    d. Action taken to segregate the produced food inside the industry

61. CCP in HACCP stands for
    a. Cross contact points
    b. Critical control points
    c. Critical contact points
    d. Critical certification points

62. The main objective of ISO 22000 is to
    a. Increase the employee productivity
    b. Increase the employee morale
    c. To certify the plant
    d. To establish a food safety management system

63. Which is the main index organism to achieve complete safety of milk in pasteurization of milk?
    a. *Mycobacterium tuberculosis*
    b. *Staphylococcus Aureus*
    c. *E. Coli.*
    d. *Listeria Monocytogenes*

64. "Date of manufacture" indicates the
    a. Date on which the food is procured
    b. Date on which the food becomes the product as described
    c. Date on which the food is placed in container in which it will be ultimately sold
    d. Date on which it is packed

65. A standard practice ————, which restores nutrients that were lost in processing to near original levels.
    a. Ergonomics
    b. Functional
    c. Fortification
    d. Enrichment

66. What is produced in a calf's stomach to help curdle milk and used in the production of cheese?
    a. chymosin
    b. bacteriophage
    c. antibiotic
    d. pasteurization

67. Fruit juices are deaerated before allowed in to the pasteuriser is done in order to
    a. Reduce fouling of pasteuriser
    b. Reduce oxidation deterioration
    c. Increase the rate of heat transfer
    d. Decrease the rate of heat transfer

68. Which of the following foods cannot be treated at high pressure?
    a. Bread
    b. Meat
    c. Fruit juice
    d. Jam

69. Which of the following food preservation methods are suitable to reduce the loss of nutrients when preparing fruits and vegetables?
    a. Freezing
    b. Using preservatives
    c. Drying and blanching
    d. All of the above

70. In freeze drying, removal of moisture is due to
    a. Boiling
    b. Condensation
    c. Sublimation
    d. Pressure reduction

71. The water activity of the food product at the end of constant drying rate is
    a. Less than 1
    b. Remains constant at 1
    c. Equals to zero
    d. Drops below 2

72. In high fructose corn syrup production, the enzyme used for the conversion of glucose to fructose is
    a. Isomerase
    b. Invertase
    c. Amylase
    d. Epimerase

73. Unplanned crystallization of sugar in a confectioneries is called
    a. Winnowing
    b. Panning
    c. Fudging
    d. Engrossing

74. What is the form of Iodine in Iodized Salt?
    a. I_2
    b. KIO_3
    c. KI
    d. NaI

75. Tocopherol is an example of
    a. Anticaking agent
    b. Flavouring agent
    c. Antioxidant
    d. None of the above

76. At which temperature frozen storage is generally operated?
    a. –0°C
    b. –18°C
    c. –50°C
    d. –60°C

77. A solution is made by dissolving 1 kilo mole of solute in 2000 kg of solvent. The molality of the solution is
    a. 2
    b. 1
    c. 0.5
    d. 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
    a. x_1 / x_2
    b. x_2 / x_1
    c. $1-(x_1 / x_2)$
    d. $1 / x_2$

79. The increase in the temperature of the aqueous solution will result in decrease of its
    a. weight % of the solute
    b. mole fraction of the solute
    c. molarity
    d. molality

80. What percent of Ca by weight is present in $CaCO_3$?
    a. 40
    b. 48
    c. 96
    d. 12

81. What is the equivalent weight of Na_2CO_3 in the reaction, represented by $Na_2CO_3+HCl \rightarrow NaHCO_3+NaCl$?
    a. 53
    b. 5.3
    c. 106
    d. 10.6

82. Multistage compressors are used in industry, because they
    a. reduce the cost of compressor
    b. reduce the size requirement
    c. resemble closely to isothermal compression
    d. 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?
   a. greater than the vapour pressure of the liquid
   b. less than the vapour pressure of the liquid
   c. equal to the vapour pressure of the liquid
   d. less than barometric pressure

84. Assuming flow to be laminar, if the diameter of the pipe is halved, then the pressure drop will
   a. increase
   b. decrease
   c. remain same
   d. be quadrupled

85. Which type of pump is used for the transfer of solution of thick slurry?
   a. reciprocating
   b. gear
   c. diaphragm
   d. centrifugal

86. Cavitation in a pump creates so many undesirable effects. Out of the following, which is not an undesirable effect created by cavitation?
   a. Decrease in effect
   b. Increase in thrust
   c. Develops noise
   d. Develops high pressure

87. How the head loss in turbulent flow in a pipe varies?
   a. directly as the velocity
   b. inversely as the square of the velocity
   c. approximately as the square of the velocity
   d. inversely as the square of the diameter

88. Power required by a centrifugal pump is proportional to (Where, D = diameter, N = rpm)
   a. N^2D^3
   b. ND^2
   c. N^2D
   d. N^3D

89. Apples are wrapped in waxed paper to
   a. Prevent sunlight for changing its colour
   b. Prevent aerobic respiration
   c. Prevent injury
   d. To make it attractive

90. Which of the following is a unique example of emulsion technology?
   a. Butter making
   b. Ice cream preparation
   c. Cream separation
   d. Chips making

91. In which of the following different plastics are combined to get certain desirable properties?
   a. Monomers
   b. Plasticizers
   c. Homopolymer
   d. Copolymer

92. Which of the following is a secondary refrigerant?
   a. NH_3
   b. H_2O
   c. CO_2
   d. R_{12}

93. Which of the following evaporators is always kept filled with liquid refrigerant?

a. Plate

b. Fin and tube

c. Flooded

d. Dry expansion

94. In ball mill, at which speed there will be centrifugation?

a. Operating

b. Normal

c. Critical

d. Below normal

95. If added sugar appear first or second on food label list for a packaged food, it means

a. List is in alphabetical

b. Its high in sugar

c. Its low in sugar

d. Position on the list is arbitrary

96. Angle formed by pouring flour as heap on flat surface is known as

a. Contact angle

b. Angle of repose

c. Angle of rip

d. Critical angle

97. In which of the following evaporators fruit juices can be concentrated?

a. Long tube

b. High pressure

c. Falling film

d. Crude filter paper

98. Heat sensitive material's with high heat of vaporization may be economically separated using

a. Liquid extraction

b. Distillation

c. Evaporation

d. Adsorption

99. Vertical screw mixers are used for mixing of

a. High viscous liquids

b. Low viscous liquids

c. Moderate viscous fluids

d. Dry solids

100. Zero energy cool chambers work on the principle of ———— cooling.

a. Hydro

b. Evaporative

c. Vacuum

d. Room