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. $\dfrac{1}{12}$

    b. $\dfrac{1}{24}$

    c. $\dfrac{1}{36}$

    d. $\dfrac{1}{48}$

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 $x\dfrac{d^2 y}{dx^2} + \dfrac{dy}{dx} = 0$ 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. $\dfrac{3\sqrt{2}}{16}$

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

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

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

8. The value of the integral $\displaystyle\int_0^a \int_0^b \int_0^c e^{x+y+z} \, dz \, dy \, dx$ 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 $\quad \nabla\phi = 2xyz^3 \, \vec{i} + x^2 z^3 \, \vec{j} + 3x^2 yz^2 \, \vec{k}$, then $\phi(x, y, z) =$

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

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

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

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

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 $\displaystyle\int_C \dfrac{1}{z} \, dz$, where C is the circle $z = e^{i\theta}$, $0 \le \theta \le \pi$ is,

    a. $\pi \dot{i}$

    b. $-\pi \dot{i}$

    c. $2\pi \dot{i}$

    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 $\dfrac{4s+1}{s^2+6s+3}$. The initial value $X(0)$ is

  a. 0

  b. 4

  c. 1/6

  d. 4/3

15. Given the inverse Fourier transform of
$$f(s) = \begin{cases} a-|s|, & |s| \le a \\ 0, & |s| > a \end{cases} \quad \text{is} \quad \frac{a^2}{2\pi}\left[\frac{\sin\frac{ax}{2}}{\frac{ax}{2}}\right]^2. \quad \text{The}$$
value of $\displaystyle\int_0^\infty \left[\frac{\sin x}{2}\right]^2 dx$ is

  a. π

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

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

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

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. $\det(A) \ne 0$

  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 $\dfrac{1}{3}$ 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

(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° ρ and 300° ρ respectively. Correlate this scale with the Centigrade scale. The reading of 0° ρ 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

08 - ARCHITECTURE

(Answer ALL questions)

41. The time taken by hydraulic lime to slake is
    a. 6 to 10 hrs
    b. 12 to 48 hrs
    c. 2 to 6 hrs
    d. More than 60 hrs

42. Surkhi is added to lime mortar to impart the following property
    a. Improve workability
    b. Improve solubility
    c. Impart hydraulicity
    d. Impart ductility

43. What are the limitations of Timber Framed Structures?
    a. heavy-weight
    b. difficult to transport materials
    c. cannot withstand tensile load
    d. prone to fire

44. How alternate header and stretcher in each course of brickwork is known as?
    a. Garden wall bond
    b. Flemish bond
    c. English bond
    d. Dutch bond

45. The defect of white decayed spots concealed by healthy wood in timber is known as
    a. Burls
    b. Foxiness
    c. Druxiness
    d. Dead wood

46. The timber which is fully or partially covered with resin is known as
    a. Impreg timber
    b. Lamin board
    c. Compreg timber
    d. Fibre board

47. What is the maximum level of background noise allowed in the classroom?
    a. 35 dB
    b. 60 dB
    c. 20 dB
    d. 10 dB

48. The formation of dull patches on finished polished surface is
    a. Grinning
    b. Saponification
    c. Fading
    d. Bloom

49. Which one of the following statements regarding distemper is wrong?
    a. They are treated as water paints
    b. They are durable than oil paints
    c. They exhibit poor workability
    d. They provide a good reflective coating

50. For M10 grade concrete the proportion of cement, sand and coarse aggregate is
    a. 1:1:2
    b. 1:3:6
    c. 1:2:4
    d. 1:4:8

51. What is the recommended slump of concrete for normal RCC work?
    a. 25 mm to 50 mm
    b. 70 mm to 80 mm
    c. 80 mm to 150 mm
    d. 160 mm to 180 mm

52. Who pioneered the Domino House?
    a. Frank Lloyd Wright
    b. Louis Sullivan
    c. Le Corbusier
    d. Auguste Perret

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53. Which of the following elements was commonly used in Gothic Architecture?
   a. Round Arches
   b. Pendentives
   c. Rose windows
   d. Battlemented parapets

54. The middle portion of an Entablature is called as
   a. Pediment
   b. Cornice
   c. Frieze
   d. Corbel

55. Which of the following mosques does not have a courtyard?
   a. Jama masjid, Cambay
   b. Atala Masjid, Jaunpur
   c. Jama Masjid, Mandu
   d. Jama Masjid, Gulbarga

56. Who designed Centre for Development Studies building in Trivandrum?
   a. Laurie Baker
   b. Raj Rewal
   c. A. Kanvinde
   d. B.V.Doshi

57. The cold bath area in a Roman bath is called as
   a. Calidarium
   b. Apodyterium
   c. Palaestra
   d. Frigidarium

58. Which of the following is not a character of Saxon Building?
   a. Pilaster Strips
   b. Double Splayed windows
   c. Long and short quoins
   d. Buttressed walls

59. Ogee arch tracery is used widely in —————— style of architecture.
   a. Perpendicular Gothic
   b. Decorated Gothic
   c. Romanesque
   d. Greek

60. Which of the building is designed by Louis Kahn?
   a. Capitol Complex in Chandigarh
   b. Kimbell Art Museum
   c. Yale School of Architecture
   d. Tokyo Imperial Hotel

61. Which of the following architects designed Carson Pirie Scott Store building?
   a. Louis Sullivan
   b. Mies van der Rohe
   c. William Le Baron Jenney
   d. Richardson

62. What was the population of contemporary city proposed by Le Corbusier?
   a. 1 million
   b. 4 million
   c. 3 million
   d. 5 million

63. Santa Maria del Fiore cathedral has
   a. Pendentive dome
   b. double shell dome
   c. a conical dome
   d. hemispherical dome

64. The Mysore Palace was designed by
   a. George Willet
   b. Henry Irwin
   c. Edwin Lutyens
   d. James Ransome

65. The alteration or repetition of elements with defined intervals between them, creates a sense of movement and it is used to establish a texture or pattern
    a. Contrast
    b. Rhythm
    c. Monotony
    d. Emphasis

66. Gandhi Nagar plan in Gujarat is an example for
    a. Clustered organization
    b. Organic organization
    c. Radial organization
    d. Grid organization

67. Which of the following architects is NOT a part of De-constructivist movement?
    a. Rem Koolhass
    b. Mies Van de Rohe
    c. Peter Eisenmann
    d. Bernard Tschumi

68. Which one of the following DOES NOT come under Schmitt's classification of design method?
    a. Routine design method
    b. Creative design Method
    c. Innovative design method
    d. Craft design method

69. The book "The Pattern Language" is written by
    a. Frank Gehry
    b. Walter Gropius
    c. Le Corbusier
    d. Chirstopher Alexander

70. Post-Facto Explications diagram illustrates
    a. abstract notions and contains scaled comparison of volumes
    b. elements in relation to building form after the design is completed
    c. relation to Sensorial or Experiential aspects of the design concept
    d. the details of Sequence of steps in a design development process

71. The Visionary diagram named "Plug-in City" is done by
    a. Cedric Price
    b. Peter Cook
    c. Yona Freidmann
    d. Arato Isazaki

72. Which of the following will not produce echo?
    a. Mirror
    b. Rock
    c. Marble
    d. Porous materials

73. Bulking of sand is highest in
    a. Coarse sand
    b. Fine Sand
    c. Medium sand
    d. Coarse and medium sand

74. One of the fractal types, Koch Snow flake starts with the basic shape is
    a. Dodecahedron
    b. Circle
    c. Square
    d. Equilateral triangle

75. Which of the following characteristics is NOT related to fractal?
    a. Deterministic
    b. Evolutionary
    c. Self-Similar
    d. Recursive

76. Who said the statement, "Liquid Architecture is an architecture, whose form is contingent on the interest of the beholder"?
    a. Greg Lynn
    b. Marcos Novak
    c. Peter Eisenmann
    d. Bernard Tschumi

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77. The use of dimming systems for street lighting is recommended when the supply voltage exceeds
   a. 220 V
   b. 240 V
   c. 440 V
   d. 415 V

78. Through Solids, Sound travels as
   a. Longitudinal waves
   b. Transverse waves
   c. Transverse and Longitudinal waves
   d. Compression waves

79. An anechoic chamber is a room designed to
   a. Completely absorb reflections of either sound or electromagnetic waves
   b. Reflect sound or electromagnetic waves
   c. Absorb electromagnetic waves
   d. transmit electromagnetic waves

80. Which is the valve used to maintain constant water level and to prevent overflow in plumbing?
   a. Float valve and ball cock
   b. Gate Valve
   c. Globe Valve
   d. Butterfly Valve

81. Low pressure sodium vapor lamps have the following disadvantage compared to high pressure sodium vapor lamps
   a. Costly
   b. Poor color rendering
   c. Inefficient
   d. Can only be used for indoor applications

82. What is the color code for single live wiring in India?
   a. Red
   b. Black
   c. Yellow
   d. Green

83. As per Indian Standards, the number of water closets for male personnel should be ——————— in office buildings.
   a. 1 for every 25 persons or part thereof
   b. 1 for every 30 persons or part thereof
   c. 1 for every 40 persons or part thereof
   d. 2 for every 40 persons or part thereof

84. Where Busbars are used in?
   a. Electrical systems
   b. Barrier free system
   c. Bus handles
   d. None of the above

85. Which one of the following is Sound absorbing material?
   a. porous
   b. solid
   c. transparent
   d. none of the above

86. Urban mountain at Copenhagen was designed by
   a. Bjarke Ingels
   b. Chris Precht
   c. Sir Norman Foster
   d. Daniel Libeskind

87. Where Biometrics is used in?
   a. Automation
   b. Smart buildings
   c. Security systems
   d. All of the above

88. Creep in concrete is defined as deformation of structure
   a. Due to increase in load
   b. Under sustained load
   c. Under acute shocks
   d. All of the above

89. Neighbourhood unit concept was crystalised by
   a. John F C Turner
   b. C A Perry
   c. Doxiadis
   d. William Drummond

90. The Radbum planning in New Jersey constituted of
   a. Small walkable blocks
   b. Hierarchical transportation systems
   c. Parks as backbone
   d. All of the above

91. What is the aim of the National Slum Development Programme?
   a. Improve physical amenities like water supply and drainage in non-notified slums
   b. Improve community infrastructure such as Schools and Community Centers in notified slums
   c. Upgrade housing in non-notified slums
   d. All of the above

92. The building sector accounts for ———— of global energy consumption
   a. 30 — 40 %
   b. 10 — 15 %
   c. 50 — 60 %
   d. 20 — 25 %

93. What is the Core focus of Urban housing and habitat policy 2007?
   a. Increased supply of service land
   b. Regional planning approach
   c. Affordable housing for all
   d. Slum redevelopment

94. What is the name of the housing unit constructed under Pradhan Mantri Gramin Awas Yojana?
   a. Female of the household
   b. Male of the household
   c. Village administrative officer
   d. Community head

95. Prefabrication production was pioneered in India by
   a. Tata housing
   b. DTH manufacturing
   c. Hindustan Housing Factory
   d. Pressmach

96. Tax incremental financing in Hyderabad model is to pay for
   a. Urban Infrastructure such as Storm water drains, parks and roads
   b. Education
   c. Land
   d. Institutions

97. Missing middle in housing describes
   a. Highrise housing
   b. Duplexes, town houses and small apartments
   c. Social, affordable housing
   d. Eco, sustainable housing

98. Which of the following is organically developed?
   a. Old Delhi
   b. New Delhi
   c. Dwaraka sub-city
   d. Chandigarh

99. Which of the following constitutes landslides due to geologic factors?
   a. Weak strength of material below ground surface
   b. Excavation of slope for construction
   c. Cutting/filling done near stream
   d. All of the above

100. To withstand flooding, shelters and settlement should be
   a. sited above flood level
   b. sited in low lying areas
   c. of rectangular configuration
   d. built on uncompacted ground

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