

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

08 - ARCHITECTURE

(Answer ALL questions)

41. The time taken by hydraulic lime to slake is
- 6 to 10 hrs
 - 12 to 48 hrs
 - 2 to 6 hrs
 - More than 60 hrs
42. Surkhi is added to lime mortar to impart the following property
- Improve workability
 - Improve solubility
 - Impart hydraulicity
 - Impart ductility
43. What are the limitations of Timber Framed Structures?
- heavy-weight
 - difficult to transport materials
 - cannot withstand tensile load
 - prone to fire
44. How alternate header and stretcher in each course of brickwork is known as?
- Garden wall bond
 - Flemish bond
 - English bond
 - Dutch bond
45. The defect of white decayed spots concealed by healthy wood in timber is known as
- Burls
 - Foxiness
 - Druxiness
 - Dead wood
46. The timber which is fully or partially covered with resin is known as
- Impreg timber
 - Lamin board
 - Compreg timber
 - Fibre board
47. What is the maximum level of background noise allowed in the classroom?
- 35 dB
 - 60 dB
 - 20 dB
 - 10 dB
48. The formation of dull patches on finished polished surface is
- Grinning
 - Saponification
 - Fading
 - Bloom
49. Which one of the following statements regarding distemper is wrong?
- They are treated as water paints
 - They are durable than oil paints
 - They exhibit poor workability
 - They provide a good reflective coating
50. For M10 grade concrete the proportion of cement, sand and coarse aggregate is
- 1:1:2
 - 1:3:6
 - 1:2:4
 - 1:4:8
51. What is the recommended slump of concrete for normal RCC work?
- 25 mm to 50 mm
 - 70 mm to 80 mm
 - 80 mm to 150 mm
 - 160 mm to 180 mm
52. Who pioneered the Domino House?
- Frank Lloyd Wright
 - Louis Sullivan
 - Le Corbusier
 - Auguste Perret

53. Which of the following elements was commonly used in Gothic Architecture?
- Round Arches
 - Pendentives
 - Rose windows
 - Battlemented parapets
54. The middle portion of an Entablature is called as
- Pediment
 - Cornice
 - Frieze
 - Corbel
55. Which of the following mosques does not have a courtyard?
- Jama masjid, Cambay
 - Atala Masjid, Jaunpur
 - Jama Masjid, Mandu
 - Jama Masjid, Gulbarga
56. Who designed Centre for Development Studies building in Trivandrum?
- Laurie Baker
 - Raj Rewal
 - A. Kanvinde
 - B.V.Doshi
57. The cold bath area in a Roman bath is called as
- Calidarium
 - Apodyterium
 - Palaestra
 - Frigidarium
58. Which of the following is not a character of Saxon Building?
- Pilaster Strips
 - Double Splayed windows
 - Long and short quoins
 - Buttressed walls
59. Ogee arch tracery is used widely in _____ style of architecture.
- Perpendicular Gothic
 - Decorated Gothic
 - Romanesque
 - Greek
60. Which of the building is designed by Louis Kahn?
- Capitol Complex in Chandigarh
 - Kimbell Art Museum
 - Yale School of Architecture
 - Tokyo Imperial Hotel
61. Which of the following architects designed Carson Pirie Scott Store building?
- Louis Sullivan
 - Mies van der Rohe
 - William Le Baron Jenney
 - Richardson
62. What was the population of contemporary city proposed by Le Corbusier?
- 1 million
 - 4 million
 - 3 million
 - 5 million
63. Santa Maria del Fiore cathedral has
- Pendentive dome
 - double shell dome
 - a conical dome
 - hemispherical dome
64. The Mysore Palace was designed by
- George Willet
 - Henry Irwin
 - Edwin Lutyens
 - 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
- Contrast
 - Rhythm
 - Monotony
 - Emphasis
66. Gandhi Nagar plan in Gujarat is an example for
- Clustered organization
 - Organic organization
 - Radial organization
 - Grid organization
67. Which of the following architects is NOT a part of De-constructivist movement?
- Rem Koolhaas
 - Mies Van de Rohe
 - Peter Eisenmann
 - Bernard Tschumi
68. Which one of the following DOES NOT come under Schmitt's classification of design method?
- Routine design method
 - Creative design Method
 - Innovative design method
 - Craft design method
69. The book "The Pattern Language" is written by
- Frank Gehry
 - Walter Gropius
 - Le Corbusier
 - Christopher Alexander
70. Post-Facto Explications diagram illustrates
- abstract notions and contains scaled comparison of volumes
 - elements in relation to building form after the design is completed
 - relation to Sensorial or Experiential aspects of the design concept
 - the details of Sequence of steps in a design development process
71. The Visionary diagram named "Plug-in City" is done by
- Cedric Price
 - Peter Cook
 - Yona Freidmann
 - Arato Isazaki
72. Which of the following will not produce echo?
- Mirror
 - Rock
 - Marble
 - Porous materials
73. Bulking of sand is highest in
- Coarse sand
 - Fine Sand
 - Medium sand
 - Coarse and medium sand
74. One of the fractal types, Koch Snow flake starts with the basic shape is
- Dodecahedron
 - Circle
 - Square
 - Equilateral triangle
75. Which of the following characteristics is NOT related to fractal?
- Deterministic
 - Evolutionary
 - Self-Similar
 - Recursive
76. Who said the statement, "Liquid Architecture is an architecture, whose form is contingent on the interest of the beholder"?
- Greg Lynn
 - Marcos Novak
 - Peter Eisenmann
 - Bernard Tschumi

77. The use of dimming systems for street lighting is recommended when the supply voltage exceeds
- 220 V
 - 240 V
 - 440 V
 - 415 V
78. Through Solids, Sound travels as
- Longitudinal waves
 - Transverse waves
 - Transverse and Longitudinal waves
 - Compression waves
79. An anechoic chamber is a room designed to
- Completely absorb reflections of either sound or electromagnetic waves
 - Reflect sound or electromagnetic waves
 - Absorb electromagnetic waves
 - transmit electromagnetic waves
80. Which is the valve used to maintain constant water level and to prevent overflow in plumbing?
- Float valve and ball cock
 - Gate Valve
 - Globe Valve
 - Butterfly Valve
81. Low pressure sodium vapor lamps have the following disadvantage compared to high pressure sodium vapor lamps
- Costly
 - Poor color rendering
 - Inefficient
 - Can only be used for indoor applications
82. What is the color code for single live wiring in India?
- Red
 - Black
 - Yellow
 - Green
83. As per Indian Standards, the number of water closets for male personnel should be _____ in office buildings.
- 1 for every 25 persons or part thereof
 - 1 for every 30 persons or part thereof
 - 1 for every 40 persons or part thereof
 - 2 for every 40 persons or part thereof
84. Where Busbars are used in?
- Electrical systems
 - Barrier free system
 - Bus handles
 - None of the above
85. Which one of the following is Sound absorbing material?
- porous
 - solid
 - transparent
 - none of the above
86. Urban mountain at Copenhagen was designed by
- Bjarke Ingels
 - Chris Precht
 - Sir Norman Foster
 - Daniel Libeskind
87. Where Biometrics is used in?
- Automation
 - Smart buildings
 - Security systems
 - All of the above
88. Creep in concrete is defined as deformation of structure
- Due to increase in load
 - Under sustained load
 - Under acute shocks
 - All of the above
89. Neighbourhood unit concept was crystallised by
- John F C Turner
 - C A Perry
 - Doxiadis
 - William Drummond

90. The Radburn planning in New Jersey constituted of
- Small walkable blocks
 - Hierarchical transportation systems
 - Parks as backbone
 - All of the above
91. What is the aim of the National Slum Development Programme?
- Improve physical amenities like water supply and drainage in non-notified slums
 - Improve community infrastructure such as Schools and Community Centers in notified slums
 - Upgrade housing in non-notified slums
 - All of the above
92. The building sector accounts for _____ of global energy consumption
- 30 — 40 %
 - 10 — 15 %
 - 50 — 60 %
 - 20 — 25 %
93. What is the Core focus of Urban housing and habitat policy 2007?
- Increased supply of service land
 - Regional planning approach
 - Affordable housing for all
 - Slum redevelopment
94. What is the name of the housing unit constructed under Pradhan Mantri Gramin Awas Yojana?
- Female of the household
 - Male of the household
 - Village administrative officer
 - Community head
95. Prefabrication production was pioneered in India by
- Tata housing
 - DTH manufacturing
 - Hindustan Housing Factory
 - Pressmach
96. Tax incremental financing in Hyderabad model is to pay for
- Urban Infrastructure such as Storm water drains, parks and roads
 - Education
 - Land
 - Institutions
97. Missing middle in housing describes
- Highrise housing
 - Duplexes, town houses and small apartments
 - Social, affordable housing
 - Eco, sustainable housing
98. Which of the following is organically developed?
- Old Delhi
 - New Delhi
 - Dwaraka sub-city
 - Chandigarh
99. Which of the following constitutes landslides due to geologic factors?
- Weak strength of material below ground surface
 - Excavation of slope for construction
 - Cutting/filling done near stream
 - All of the above
100. To withstand flooding, shelters and settlement should be
- sited above flood level
 - sited in low lying areas
 - of rectangular configuration
 - built on uncompacted ground