

018/2024

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. If for any 2×2 square matrix A , $A(\text{adj}A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$, then find the value of $|A|$.

(A) 64

(B) 0

(C) 8

(D) 1

2. The number of possible matrices of order 3×3 with each entry 0 or 1 is :

(A) 27

(B) 18

(C) 81

(D) 512

3. The conjugate of $i^9 + i^{18}$ is :

(A) $-1 + i$

(B) $-1 - i$

(C) $1 - i$

(D) $1 + i$

4. The value of $(1 + i)^{24}$ is :

(A) $(\sqrt{2})^{12}$

(B) 2^{12}

(C) 2^{24}

(D) 2^{11}

5. The multiplicative inverse of $3 + 4i$ is :

(A) $\frac{3 - 4i}{25}$

(B) $\frac{3 + 4i}{25}$

(C) $\frac{3 + i}{5}$

(D) $\frac{3 - i}{5}$

6. What is the centre of the circle $3x^2 + 3y^2 - 12x + 15y + 7 = 0$?

(A) (12, -15)

(B) (-12, 15)

(C) (2, -5/2)

(D) (-2, 5/2)

A

3

[P.T.O.]

7. The equation in cylindrical coordinates is $r^2 \cos 2\theta = z$, then equation in rectangular coordinates is :

(A) $x^2 + y^2 = z$

(B) $x^2 - y^2 = z$

(C) $x^2 + y^2 = 2z$

(D) None of these

8. $\lim_{x \rightarrow 0} x \ln x =$

(A) 0

(B) ∞

(C) 1

(D) not defined

9. A missile is fired from the ground level rises x metre vertically upwards in t seconds, where

$x = 100t - \frac{25}{2}t^2$. The maximum height reached is

(A) 200 m

(B) 125 m

(C) 160 m

(D) 190 m

10. The order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{4/3} = 7 \frac{d^2y}{dx^2}$ is :

(A) 2, 3

(B) 2, 1

(C) 2, 4

(D) 3, 2

11. The solution of the equation $\frac{dy}{dx} + y \tan x = \sec x$ is :

(A) $y = \tan x + C$

(B) $y = \sin x + C \cos x$

(C) $y \sec x = 1 + C \cos x$

(D) None of these

12. If $P(1, 2, 3)$ and $Q(2, 4, 5)$ are two points, the magnitude of the vector \vec{PQ} is :

(A) 3

(B) 4

(C) 0

(D) 1

13. The vector field $F = (x^2 - yz)\hat{i} + (y^2 - xz)\hat{j} + (z^2 - xy)\hat{k}$ is :
- (A) rotational (B) irrotational
(C) solenoidal (D) none of these
14. The number of ideals in the ring Z_{60} :
- (A) 16 (B) 20
(C) 12 (D) 18
15. Let G be an abelian group and E is a subgroup of G , then :
- (A) E must be cyclic in G (B) E must be normal in G
(C) E may or may not normal in G (D) None of the above
16. A cyclist pedals from his house to his college at a speed of 10 km/hr and back from the college to his house at a speed of 15 km/hr. Find the average speed.
- (A) 14 (B) 12
(C) 13.5 (D) 12.5
17. Coefficient of variation is :
- (A) $\frac{\text{Standard Deviation}}{\text{Arithmetic Mean}} * 100$ (B) $\frac{\text{Arithmetic Mean}}{\text{Standard Deviation}} * 100$
(C) $\frac{\text{Arithmetic Mean}}{\text{Variance}} * 100$ (D) $\frac{\text{Range}}{\text{Standard Deviation}} * 100$
18. If the regression coefficient of X on Y and Y on X are 0.9 and 0.4 respectively, then the correlation coefficient between X and Y is :
- (A) 0.36 (B) 0.6
(C) 0.18 (D) 0.12
19. A letter of the English alphabet is chosen at random. Calculate the probability that the letter so chosen is a vowel :
- (A) $\frac{21}{26}$ (B) $\frac{12}{26}$
(C) $\frac{5}{26}$ (D) $\frac{11}{26}$

20. Events A and B are said to be independent if :
- (A) $P(A \cup B) = P(A) * P(B)$ (B) $P(A \cap B) = P(A) * P(B)$
(C) $P(A \cup B) = P(A) + P(B)$ (D) $P(A \cap B) = P(A) + P(B)$
21. Which of the following distribution has equal mean and variance?
- (A) Normal (B) Poisson
(C) Binomial (D) Exponential
22. If X is a random variable, then which one is the correct expression for $V(aX + b)$:
- (A) $a^2V(X) + b^2$ (B) $a^2V(X)$
(C) $aV(X) + b$ (D) $aV(X)$
23. Find the mode of the Binomial distribution for which mean is 4 and variance is 3.
- (A) 4.25 (B) 5
(C) 4 (D) None of these
24. If X_1, X_2, \dots, X_n are n independent $N(0, 1)$ random variables, then the distribution of $X_1 - 2X_2 + X_3$ is :
- (A) $N(0, 3)$ (B) $N(0, 1)$
(C) $N(0, 6)$ (D) $N(1, 3)$
25. An unbiased estimate of population variance σ^2 is :
- (A) s^2 (B) $\frac{n}{n-1}s^2$
(C) $\frac{n-1}{n}s^2$ (D) $(n-1)s^2$
26. Which of the following is not a sufficient condition for a random variable to be a consistent estimate of θ ?
- (A) $E(t_n) \rightarrow \theta$ (B) $V(t_n) \rightarrow 0$
(C) $E(t_n) = \theta$ (D) $V(t_n) \rightarrow \infty$

27. Power of a statistical test is :
- (A) $P(\text{Reject } H_0 / H_0 \text{ true})$ (B) $P(\text{Reject } H_0 / H_0 \text{ False})$
(C) $P(\text{Accept } H_0 / H_0 \text{ False})$ (D) None of these
28. If $X_i, i=1, 2, 3, \dots, 16$ are independent random variables following normal distribution $N(5, 1)$, then the variance of sample mean is :
- (A) $\frac{1}{4}$ (B) $\frac{1}{5}$
(C) $\frac{1}{16}$ (D) None of these
29. Whether a test is one sided or two sided depends on :
- (A) Null Hypothesis (B) Alternative Hypothesis
(C) Composite Hypothesis (D) All the above
30. A sample of 15 specimen taken from a normal population with mean value 51. The sample has a mean 62 with a variance of 25. To test $H_0 : \mu = 51$ against $H_1 : \mu \neq 51$, you will use :
- (A) Z test (B) F test
(C) t - test (D) Chi square test
31. Ratio of tensile stress to tensile strain of a material is called :
- (A) Young's modulus (B) Bulk modulus
(C) Rigidity modulus (D) Poisson's ratio
32. Which of following is/are the application of Bernoulli's theorem?
- (i) spray bottle
(ii) spinning of ball
(iii) venturi meter
(iv) pyrometer
- (A) (i) and (ii) are correct (B) (iii) and (iv) are correct
(C) (i), (ii) and (iii) are correct (D) All are correct

33. Excess pressure inside a soap bubble of radius 1 cm is (surface tension = 25×10^{-3} N/m)
- (A) 1 Pa (B) 5 Pa
(C) 8 Pa (D) 10 Pa
34. Water is flowing through a horizontal tube of non-uniform cross section, at a place of the tube the radius is 1.0 cm, velocity of water is 2 m/s. What will be the velocity of flow at radius is 2.0 cm?
- (A) 0.4 m/s (B) 0.5 m/s
(C) 0.6 m/s (D) 1 m/s
35. Thermal radiation is :
- (i) electromagnetic
(ii) travels with a speed of light
(iii) wavelength in ultraviolet region
- (A) (i) and (ii) are correct (B) (i) and (iii) are correct
(C) (ii) and (iii) are correct (D) All are correct
36. For adiabatic process first law of thermodynamics as :
- (A) $Q = \Delta U + W$ (B) $\Delta U = W$
(C) $Q = -W$ (D) $\Delta U = -W$
37. Efficiency of Carnot's engine working between 127°C and 27°C is :
- (A) 75% (B) 50%
(C) 25% (D) 15%
38. Interference of two coherent sources on a screen, if path difference at a point is 3λ , where λ is the wavelength then intensity and phase difference at that point are :
- (A) bright and 3π (B) bright and 6π
(C) dark and 3π (D) dark and 6π

39. He-Ne laser is :
- (A) Gas laser (B) Liquid laser
(C) Solid laser (D) Diode laser
40. An Optical fibre with refractive index of core and cladding are 1.55 and 1.50 respectively, numerical aperture of the fibre is nearly :
- (A) 0.25 (B) 0.30
(C) 0.35 (D) 0.40
41. In Hydrogen spectra, wavelength of H_{β} (H-beta) line in balmer series (R is Rydberg constant) :
- (A) $\frac{2}{3R}$ (B) $\frac{4}{3R}$
(C) $\frac{16}{3R}$ (D) $\frac{3}{4R}$
42. Incident light of energy 3 eV falls on a photosensitive material of work function 2 eV, maximum kinetic energy of electron emitted is :
- (A) 3.2×10^{-19} J (B) 3×10^{-19} J
(C) 2×10^{-19} J (D) 1.6×10^{-19} J
43. Atom bomb is based on the principle of :
- (A) Nuclear fission (B) Nuclear fusion
(C) Both fission and fusion (D) Radio activity
44. Lattice parameter of crystal is $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$ corresponds to
- (A) Triclinic (B) Tetragonal
(C) Hexagonal (D) Orthorhombic
45. Interplanar distance between (1 2 2) plane in simple cubic lattice having lattice parameter $a = 6.3 \text{ \AA}$:
- (A) 2.1 \AA (B) 3.2 \AA
(C) 4.2 \AA (D) 6.3 \AA

46. What is the primary difference between accounting and book keeping?
- (A) Book keeping involves analyzing financial data, while accounting involves recording transactions
 - (B) Book keeping focuses on day-to-day recording, while accounting involves interpreting financial data
 - (C) Accounting is only concerned with financial statements, while book keeping deals with ledger entries
 - (D) There is no difference between accounting and book keeping
47. What is the purpose of a trial balance?
- (A) To list all financial transactions of a company
 - (B) To record day-to-day business transactions
 - (C) To prepare financial statements
 - (D) To verify the accuracy of debit and credit entries in the ledger
48. What does the debt-to-equity ratio indicate?
- (A) A company's liquidity
 - (B) The extent of a company's leverage
 - (C) The efficiency of inventory management
 - (D) The company's overall profitability
49. What does the term "horizontal analysis" refer to in financial statement analysis?
- (A) Comparing financial data over different time periods
 - (B) Comparing financial data with industry averages
 - (C) Analyzing data vertically within a financial statement
 - (D) Assessing the impact of economic conditions on financial data
50. When are revenues recognized under the accrual basis of accounting?
- (A) When cash is received
 - (B) When invoices are sent
 - (C) When they are earned
 - (D) When services are provided

51. What is the primary principle of sound lending for banks?
- (A) Offering loans with high interest rates
 - (B) Ignoring borrower's credit history
 - (C) Granting loans without collateral
 - (D) Minimizing credit risk while maximizing profits
52. What distinguishes cash credit from other types of lending?
- (A) Flexible withdrawal limits
 - (B) Fixed interest rate
 - (C) No need for collateral
 - (D) Short repayment duration
53. Which mode of charging security allows the lender to hold possession of the asset until the borrower repays the loan?
- (A) Lien
 - (B) Mortgage
 - (C) Hypothecation
 - (D) Pledge
54. What characterizes a standard asset in banking?
- (A) Low credit rating
 - (B) Timely payment of dues
 - (C) Default on loan repayments
 - (D) Collateral offered for the loan
55. What does a higher provision for bad and doubtful assets indicate for a bank?
- (A) Strong asset quality
 - (B) Lower risk exposure
 - (C) Potential financial stress due to NPAs
 - (D) Higher profitability
56. Which document outlines the rules and regulations governing a cooperative society's internal functioning?
- (A) Memorandum of Association
 - (B) Articles of Association
 - (C) Bye-laws
 - (D) Prospectus

57. Which authority has the power to dissolve a cooperative society?
- (A) Board of Directors (B) General Body Meeting
(C) Government (D) Registrar of Cooperative Societies
58. What is the primary aim of the principle of autonomy and independence in cooperative societies?
- (A) Ensuring self-reliance and freedom
(B) Promoting isolation from other organizations
(C) Encouraging political affiliations
(D) Avoiding regulatory compliance
59. How are funds from a reserve fund primarily utilized by a cooperative society?
- (A) Daily operational expenses (B) Members' dividends
(C) Expansion projects (D) Employee salaries
60. What is the maximum number of directors required for the management of a cooperative society?
- (A) 25 (B) 20
(C) 21 (D) 15
61. Which of the following is not a type modifier in C?
- (A) Signed (B) Long
(C) int (D) short
62. Which function is appropriate to accept a line of text in C?
- (A) getch() (B) getche()
(C) scanf() (D) gets()

63. Arrays are stored in :
- (A) Contiguous memory locations (B) Non contiguous memory locations
(C) Either (A) or (B) (D) None of the above
64. In an array x, &x[0] denotes the
- (A) Name of the array (B) Starting index position
(C) First element (D) Base address of the array
65. If p is an integer pointer variable and if p = 4046, then p++ returns
- (A) 4047 (B) 4048
(C) 4046 (D) 4050
66. Stack works on the principle of :
- (A) LIFO (B) FIFO
(C) FILO (D) None of the above
67. The data structure used during a function call is :
- (A) Queue (B) Stack
(C) Linear List (D) Array
68. A linked list in which last node points to the beginning of the list is :
- (A) Circular linked list (B) Doubly linked list
(C) Either (A) or (B) (D) None of the above
69. Algorithm used to find Minimum cost spanning tree is :
- (A) Kruskal's algorithm (B) Prim's algorithm
(C) Either (A) or (B) (D) None of the above
70. For an AVL tree, the balance factor of each node is :
- (A) -1 (B) 0
(C) 1 (D) Any of the above

71. The main characteristic of second-generation computers is :
- (A) Transistors (B) Vacuum tubes
(C) VLSI (D) Integrated chips
72. Small, fast and expensive memory that stores data that are accessed frequently :
- (A) Secondary memory (B) Cache memory
(C) Primary memory (D) Magnetic tape
73. Which among the following is not a pointing device?
- (A) Joystick (B) Mouse
(C) Light pen (D) Keyboard
74. OMR stands for :
- (A) Optical Magnetic Reader (B) Optical Mark Reader
(C) Optical Mark Recognition (D) Optical Magnetic Recognition
75. An example for an impact printer is :
- (A) Dot matrix (B) Daisy wheel
(C) Inkjet (D) Either (A) or (B)
76. Which is volatile?
- (A) PROM (B) Flash ROM
(C) RAM (D) EPROM
77. The concentric circles of magnetic disks are :
- (A) Tracks (B) Sectors
(C) Cylinders (D) Circles

78. Which is the medium used in optical storage systems for reading and recording data?
- (A) UV light (B) Laser light
(C) High energy visible light (D) Black light
79. Which of the following is known as mid-range computer?
- (A) Micro computer (B) Mini computer
(C) Super computer (D) Main frame
80. A memory often referred to as “imaginary memory” is :
- (A) Primary memory (B) Secondary memory
(C) Cache memory (D) Virtual memory
81. What role does the Dispatcher play in a multi-programming environment?
- (A) Allocating memory to processes
(B) Switching control from one process to another
(C) Managing device drivers
(D) Handling file system operations
82. Which issue is addressed by the concept of ‘Admission Control’ in scheduling algorithms?
- (A) Starvation
(B) Priority inversion
(C) Eliminating the convoy effect
(D) Ensuring that the system does not accept more processes than it can handle
83. What does the term “Race Condition” mean in the context of thread synchronization?
- (A) A situation where two or more threads access shared data concurrently without proper synchronization
(B) A condition where threads compete for system resources
(C) A condition where threads deadlock due to circular waiting
(D) A situation where threads have equal priority, leading to contention

84. Three CPU-intensive processes have respective burst times of 5, 12 and 22 time units. They arrive at times 0, 4 and 9 respectively. If the operating system implements a Shortest Remaining Time First (SRTF) scheduling algorithm, how many context switches are required? Exclude the context switches at time zero and at the end of execution :
- (A) 1 (B) 2
(C) 3 (D) 4
85. Which page replacement algorithm is more susceptible to Belady's anomaly?
- (A) Optimal Page Replacement (B) LRU
(C) FIFO (D) Both LRU and FIFO
86. How many superkeys can be formed for the relation schema R (E, B, C, D) where E is the key?
- (A) 11 (B) 10
(C) 9 (D) 8
87. How would you describe the Relational Data Model?
- (A) Data is organized within a table using rows and columns
(B) In this model, data, objects, and their relationships are logically represented
(C) Additionally, functions, encapsulation and object identity are taken into account, alongside the ER model
(D) These data models enable the definition of data specifications, where various attributes are specified for data items of the same type
88. What technique is employed in RDBMS to create different classes of relations with the primary goal of preventing modification anomalies?
- (A) Functional Dependencies (B) Data integrity
(C) Referential integrity (D) Normal Forms

89. What does the result of the UNION operation between relation R1 and R2 include?
- (A) All the tuples of R1
 - (B) All the tuples of R1 and R2
 - (C) All the tuples of R2
 - (D) All tuples in both R1 and R2 that share common columns.
90. In the context of entity set refinement, what design process involves making distinctions explicit by refining from an initial entity set into successive levels of entity subgroupings?
- (A) Top-down
 - (B) Bottom-up
 - (C) Hierarchy
 - (D) Radical
91. How many duplex links are there in a mesh topology network with four devices?
- (A) Five
 - (B) Three
 - (C) Six
 - (D) Twelve
92. What type of network is capable of transmitting voice, video, and data?
- (A) Local Area Network
 - (B) Metropolitan Area Network
 - (C) Wide Area Network
 - (D) All the above
93. What device is utilized to interconnect similar LANs with identical protocols?
- (A) Gateways
 - (B) Bridges
 - (C) Switch
 - (D) Router
94. What system exemplifies full-duplex communication?
- (A) Radio
 - (B) Keyboard
 - (C) Telephone
 - (D) Speaker

- 95.** Identify the correct IPv4 address from the options provided.
- (A) 01.200.128.123 (B) 300.142.210.64
(C) 1011.32.16.8 (D) 128.64.0.0
- 96.** What was the original name for the 'Imitation game' among the options provided?
- (A) F-Test (B) Omega test
(C) Turning Test (D) None of the above
- 97.** What is the term for the process in Linguistic morphology that involves reducing inflected words to their root form?
- (A) Splitting (B) Stemming
(C) Sizing (D) Parsing
- 98.** "I saw her duck", what ambiguity this statement has?
- (A) Lexical ambiguity (B) Syntax Level ambiguity
(C) Semantic ambiguity (D) None of the Above
- 99.** What text parsing techniques in NLP are suitable for tasks such as noun phrase detection, verb phrase detection, subject detection and object detection?
- (A) Part of speech tagging
(B) Skip Gram and N-Gram extraction
(C) Dependency Parsing and Constituency Parsing
(D) Continuous Bag of Words
- 100.** What task serves as an example of text classification among the options given?
- (A) Speech Analysis (B) Sentiment analysis
(C) Synthetic Analysis (D) Voice Analysis

SPACE FOR ROUGH WORK

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