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1302E1635

Candidate's Seat No :_____

MSc IT BIA Sem.-1 Examination

BIAMSC - 06

Mathematical Foundation of Computer Science

Time : 2-30 Hours] **February-2025** **[Max. Marks : 70**

Instructions:

- **Figures to the right indicate Full Marks.**
- **Do not write anything on the question paper.**
- **Simple calculator is allowed. Do not use a scientific calculator.**

Marks

Q:1 Choose the correct option. [20]

(1) Which gate is known as the universal gate? [01]

(a) AND (b) OR

(c) XOR (d) NAND

(2) Which of the following combinations produces a NOR gate? [01]

(a) AND + NOT (b) OR + NOT

(c) XOR + NOT (d) NAND + NOT

(3) If A x = λ x then x is called? [01]

(a) Determinant (b) Eigenvalue

(c) Eigenvector (d) Diagonal element

(4) What is the algebraic multiplicity of an eigenvalue λ? [01]

(a) Number of times λ appears as a root of the characteristic polynomial

(b) Number of independent eigenvectors associated with λ

(c) Sum of all eigenvalues

(d) Dimension of the eigenspace of λ

(5) The eigenvalues of a triangular matrix are? [01]

(a) Its diagonal elements (b) Always positive

(c) Always zero (d) None of the above

(6) Find the determinant of matrix $\begin{bmatrix} 10 & 5 \\ 4 & 2 \end{bmatrix}$ [01]

(a) 1 (b) -2

(c) 2 (d) 0

(7) If the mean of five numbers is 20 and one of the numbers is 35, what is the mean of the remaining four numbers? [01]

(a) 12.25 (b) 16.25

(c) 15.50 (d) 17.50

(8) The mean of eight numbers is 50. If each number is increased by 5, what is the new mean? [01]

(a) 55 (b) 45

(c) 50 (d) 60

(P.T.O)

(9) What is the median of the following even-numbered dataset: 2, 4, 6, 8? [01]
(a) 5 (b) 4
(c) 6 (d) 7

(10) A die is rolled once. What is the probability of rolling a number greater than 4? [01]
(a) 1/6 (b) 1/2
(c) 1/3 (d) 2/3

(11) What is the probability of drawing a red king from a standard deck of 52 cards? [01]
(a) 1/26 (b) 1/13
(c) 1/52 (d) 1/2

(12) A bag contains 5 red balls and 7 blue balls. If one ball is drawn, what is the probability it is red, given that it is not blue? [01]
(a) 1/2 (b) 1
(c) 5/12 (d) 0

(13) A coin is tossed 3 times. What is the probability of getting exactly 2 heads? [01]
(a) 1/8 (b) 1/4
(c) 3/8 (d) 1/2

(14) Two fair dice are rolled. What is the probability that the sum of the numbers is either 7 or 11? [01]
(a) 2/9 (b) 1/3
(c) 1/6 (d) 5/36

(15) What does P(A|B) represent in probability theory? [01]
(a)The probability of event A occurring.
(b) The probability of event B occurring given that A has occurred.
(c) The probability of event A occurring given that event B has occurred.
(d) The joint probability of events A and B.

(16) The median of the data set {5, 1, 3, 2, 4} is? [01]
(a) 2 (b) 4
(c) 3 (d) 5

(17) What is the mode of the data set {3, 5, 3, 7, 8, 8, 8}? [01]
(a) 3 (b) 5
(c) 7 (d) 8

(18) In a standard deck of 52 cards, what is the probability of drawing a heart? [01]
(a) 1/4 (b) 1/3
(c) 1/2 (d) 1/13

(19) If the mean of 5 numbers is 20, and four of the numbers are 18, 22, 19, and 20, what is the 5th number? [01]
(a) 21 (b) 18
(c) 20 (d) 19

(20) If two fair dice are rolled, what is the probability of getting a sum of 6? [01]
(a) 1/6 (b) 1/36
(c) 1/12 (d) 5/36

Q:2 Answer the following question. [10]

(1) Find multiplication of determinant of matrix A and matrix B? [02]

$$A = \begin{bmatrix} 6 & 5 & 2 \\ -7 & 3 & 4 \\ -2 & 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 3 & 6 \\ 5 & 4 & 1 \\ 0 & 5 & 0 \end{bmatrix}$$

(2) Find co-factor matrix of matrix A [02]

$$A = \begin{bmatrix} 6 & 2 & 0 \\ 1 & 5 & 2 \\ -2 & 5 & 5 \end{bmatrix}$$

(3) Find value of system of linear equation by guess elimination method: [02]

$x - y + 2z = 3,$

$x + 2y + 3z = 5,$

$3x - 4y - 5z = -13$

(4) A fair dice is thrown. Find the probability of getting [02]

(1) An even integer
(2) A perfect square
(3) An integer greater then oy equal to 3

(5) Find algebraic multiplicity (AM) and geometric multiplicity (GM) of given matrix: [02]

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Q-3 Answer the following question: [15]

(1) Find mean of given data: [03]

Class	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 – 79
Freq.	2	4	5	3	1	2

(P.T.O)

(2) Find median of given data: [03]

Class	135 - 140	140 - 145	145 - 150	150 - 155	155 - 160	160 - 165
Freq.	4	7	18	11	6	5

(3) Find mode of given data: [03]

Class	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Freq.	4	6	8	9	3	2	5

(4) Find value of system of linear equation by Cramer's rule: [03]

$$x - y + z = 4$$
$$2x + y + z = 7$$
$$-x - 2y + 2z = -1$$

(5) Find inverse of matrix by adjoint method: [03]

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & -1 & 0 \\ 2 & 2 & 1 \end{bmatrix}$$

Q-4 Answer the following question: (any five) [25]

(1) Find value of system of linear equation by L-U decomposition method: [05]

$$x + y + z = 1$$
$$3x + y - 3z = 5$$
$$x - 2y - 5z = 10$$

(2) Find value of system of linear equation by L-U decomposition method: [05]

$$x + 2y + 3z = 9$$
$$4x + 5y + 6z = 24$$
$$3x + y - 2z = 4$$

(3) Find inverse of matrix by row elementary method: [05]

$$A = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{bmatrix}$$

(4) Find value of system of linear equation by guess Jordan method: [05]

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

(5) A company has 2 plants to manufacture hydraulic machines, plant 1 manufactures 70% of the hydraulic machines and plant 2 manufactures 30%. At plant 1, 80% of machines are rated of standard quality and at plant 2, 90% of machines are rated of standard quality. A machine is picked at a random and is found to be standard quality. What is the chance that it has come from plant 1? [05]

(6) (1) in a certain assembly plant, three machines A, B, C produce 30%, 45% and 25% of the products respectively. It is known from past experience that 2%, 3% and 2% of the products made by each machine respectively are defective. Suppose that a finished product is randomly selected. What is the probability that it is defective? [05]

(2) what is the probability that four T's come consecutively in the word "MISSISSIPPI"?