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(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2023 ONLY)

23UBC2A1

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY-2024

COURSE NAME: B.C.A **MAXIMUM MARKS: 75**

SEMESTER: II **TIME : 3 HOURS**

PART - III

MATHEMATICS-II MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS. (K1)

1. If a set A has n elements, then the total number of subsets of A is _____.
   a) n b) n2 c) 2^n d) 2n

2. Which type of function is defined using algebraic operations?
   a) Transcendental function b) Linear function
   c) Quadratic function d) Exponential function

3. Which type of graph allows loops and multiple edges between the same pair of vertices?
   a) Simple graph b) Multi graph c) Null graph d) PseudoGraph

4. The rank of a matrix is_____.
   a) The sum of its elements b) The maximum number of rows or columns
   c) The determinant of the matrix d) The trace of the matrix

5. Sample space means _____.
   a) The set of favorable outcomes
   b) The set of mutually exclusive events
   c) The set of all possible outcomes of a random experiment
   d) The set of impossible events

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. What is the power set of a set? Provide an example.
7. What do you mean by Symmetric Relation?
8. Determine the degree of vertex B in the following undirected graph.
   A ——— B ——— C
9. What is an Eigen value in the context of matrices?
10. State one axiom of probability.

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Illustrate the concept of Cartesian Products of sets with example.

(OR)

b) If A = {1, 2, 3}, B = {2, 3, 4} and S = {1, 3, 4} T={2, 4, 5} verify that (A X B) ∩ (S X T) = (A ∩ S) X (B ∩ T).

12. a) Explain the concept of transcendental functions and their significance in mathematics.

(OR)

b) $f: R \to R, g: R \to R \; and \; h: R \to R; f(x) = 2x, g(x) = (3x - 1) and \; h(x) = x^2 + 3 \; show \; that \; (fog)oh = fo(goh)$

(CONTD…..2)

13.a) Differentiate between undirected and directed graphs. Give examples.

(OR)

b) Describe the connectivity properties of an Isolated Graph.

14.a) Verify whether the given matrix is Singular or Non singular $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$

(OR)

b) Find the rank of the matrix

$$A = \begin{pmatrix} 1 & 1 & 1 & -1 \\ 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 2 \end{pmatrix}$$

15. a) Explain the sample space for rolling a fair six – sided die. Identify an event related to the outcomes.

(OR)

b) A bag contains 4 balls, two balls are drawn at random without replacement and are found to be blue. What is the probability that all balls in the bag are blue?

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) Given that A={0, 1, 3, 5}, B={1, 2, 4, 7}, C={1, 2, 3, 5, 8} prove that

i) $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$

ii) $(A \cap B) \cup C = (A \cup C) \cap (B \cup C)$

(OR)

b) Prove that $A - (B \cap C) = (A - B) \cup (A - C)$

17. a) Explain (i) Function (ii) Injective (iii) Surjective (iv) Bijective (v) Composite Function.

(OR)

b) Discuss the properties of symmetric, anti-symmetric, reflexive and transitive relations with suitable example.

18. a) Explain how an adjacency matrix represents a graph. Provide an example and its applications.

(OR)

b) Discuss the concept of a Hamiltonian Graph and the conditions for a graph to have a Hamiltonian cycle.

19. a) If $A = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ *and* $B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$

Find the product *AB* and *BA* and hence solve the system of linear equations

$x - y + z = 4, x - 2y - 2z = 9, 2x + y + 3z = 1$

(OR)

b) If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ find A^{-1}.

20. a) Suppose P(A), P($\bar{A}$), P(B|A) and P(B|$\bar{A}$) are known. Find an expression for P(A|B) in terms of these four probabilities.

(OR)

b) State and prove the Multiplication Law of Probability.

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