

**(FOR THE CANDIDATES ADMITTED  
DURING THE ACADEMIC YEAR 2024 ONLY)**

24UBC2A1

REG.NO. :

**N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI  
END-OF-SEMESTER EXAMINATIONS : MAY-2025**

**B.C.A  
SEMESTER II**

**MAXIMUM MARKS: 75  
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. The set of all ordered pairs  $\langle a, b \rangle$ , where  $a$  is an element of  $A$  and  $b$  is an element of  $B$ , is called \_\_\_\_\_  
(a) Binary relation (b) partial order (c) composition (d) Cartesian product
2. A relation on a set  $S$  which is \_\_\_\_\_ is called a compatibility relation  
(a) Reflexive and symmetric (b) anti-symmetric (c) transitive (d) equivalence relation
3. A point of degree 1 is called \_\_\_\_\_  
(a) Isolated point (b) end point (c) regular point (d) multi point
4. A square matrix  $A$  is said to be singular if  $|A|$  \_\_\_\_\_ 0.  
(a) = (b)  $\neq$  (c)  $\leq$  (d)  $\geq$
5. A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace?

(a)  $\frac{1}{13}$  (b)  $\frac{2}{13}$  (c)  $\frac{3}{13}$  (d)  $\frac{4}{13}$

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

6. Define universal set.
7. Define identity function.
8. Define empty graph.

9. Find the Sum of the Eigen values of  $\begin{bmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{bmatrix}$ .

10. Define Independent event.

**SECTION – B (5 X 5 = 25 MARKS)**

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

- 11 a) If  $A = \{1,5\}$ ,  $B = \{6,7,8,9\}$  and  $C = \{6,7,10\}$   
Prove that (i)  $A \times (B \cup C) = (A \times B) \cup (A \times C)$

**(OR)**

- b) Verify  $A \cup (B \cup C) = (A \cup B) \cup C$  by using Venn diagram.
12. a) Explain equivalence relation.

**(OR)**

- b) Explain binary relations with an example. (CONTD...2)

13.a) Prove that the number of vertices of odd degree in a graph is always even.

(OR)

b) Explain adjacency matrix with an example.

14. a) Compute the inverse of the matrix  $A = \begin{bmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix}$

(OR)

b) Find the Rank of the matrix  $\begin{bmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 7 \end{bmatrix}$

15.a) A problem in statistics is given to two students A and B. the odds in favour of A solving the problem are 6 and against b solving the problem 12 to 10. If A and B attempt, find the probability of the problem being solved.

(OR)

b) Mr. X and Mr. Y throw alternatively with a pair of ordinary dice. Mr. X wins if he throws 6 before Mr. Y throws 7 and Mr. Y wins if he throws 7 before Mr. X throws 6. If Mr. X begins the game. Show that the chance of his winning is 30/61.

### SECTION – C (5 X 8 = 40 MARKS)

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

(K4 (Or) K5)

16. a) If  $A = \{1,2,3\}$ ,  $B = \{1,3,5\}$  and  $C = \{2,3,4,6\}$

Find (i)  $A \cup B$  (ii)  $A \cap B$  (iii)  $A - B$  (iv)  $A \cup (B \cap C)$  (v)  $A - (B \cap C)$

(OR)

b) If  $A = \{1,2,3\}$ ,  $B = \{1,2,3,4,5\}$  and  $C = \{3,4,5,6\}$

Find (i)  $(A \Delta B)$  (ii)  $(AU(B \Delta C))$  (iii)  $(A \Delta B) \cap C$

(iv) If  $A = \{1,5\}$ ,  $B = \{6,7,8,9\}$  and  $C = \{6,7,10\}$  Prove that

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

17. a) Explain any FIVE types of functions

(OR)

b) Let  $A = \{1,2,3,4\}$  Le  $R = \{(1,1), (1,2), (2,3), (2,4), (3,4), (4,1), (4,2)\}$  and  $S = \{(3,1), (4,4), (2,3), (2,4), (1,1), (1,4)\}$  be two relations on A. compute (i) Is  $(1,3) \in R \circ R$ ? (ii) Is  $(4,3) \in S \circ R$ ?

(iii) Is  $(1,1) \in R \circ S$ ? (iv)  $S \circ R$ , (v)  $R \circ S$

18.a) Prove the following

(i) If B is a circuit matrix of a connected graph G with e edges and n vertices then prove that rank of  $B = e - n + 1$ .

(ii) Show that If G is a disconnected graph with k- components, e edges and n vertices then rank of  $B = \mu = e - n + k$

(OR)

b) Use the logical argument to prove the statement " A given connected graph G is an Euler graph if all vertices of G are of even degree"

(CONTD...3)

19. a) Determine the Eigen values and Eigen vectors of the matrix  $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ .

**(OR)**

b) Verify whether the following system of equations is consistent. If it is consistent, find the solution of  $x - 4y - 3z = -16$ ;  $4x - y + 6z = 16$ ;  $2x + 7y + 12z = 48$ ;  $5x - 5y + 3z = 0$ .

20. a) The probability that India wins a cricket test match against West Indies is known to be  $2/5$ . If India and West Indies play 3 test matches what is the probability that (i) India will loose all the three test matches. (ii) India will win at least one test match (iii) India will win all the test (iv) India will win at most one match.

**(OR)**

b) One bag contains 4 white and 2 black balls. Another contains 3 white and 5 black balls. If one ball is drawn from each bag, find the probability that (a) both are white (b) are black (c) one is white and one is black.

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**ETHICAL PAPER**