

- Q.1 (a) There are three teams of different games in a school. 21 players are in Basketball team, 26 players are in Hockey team and 29 players are in a Football team. 14 players plays Hockey and Basketball both, 15 plays Hockey and Football both, 12 plays Football and Basketball both and 8 players plays all the three games. Find the total number of players participated in games. [7]

- (b) If $f: \mathbb{R} \rightarrow \mathbb{R} - (-\infty, 5)$ is defined as $f(x) = x^2 + 4x + 9$, then find f^{-1} if it exists. [7]

OR

- Q.1 (a) Explain the following terms with example: [7]

(i) Intersection of two sets (ii) Universal set (iii) Venn diagram

- (b) For $f: \mathbb{R} - \{-1\} \rightarrow \mathbb{R} - \{-1\}$ defined as $f(x) = \frac{1-x}{1+x}$. Prove that $f \circ f$ is an identity function. [7]

- Q.2 (a) If $\bar{a} = (3, 2, 5)$ and $\bar{b} = (-4, 3, 1)$ then find $\bar{b} \times \bar{a}$, $(\bar{a} \times \bar{b}) \cdot \bar{a}$ and $(\bar{a} \cdot \bar{b})\bar{b}$. [7]

- (b) For a matrix $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, prove $A^2 - 4A + 7I_2 = O$ and hence find A^{-1} . [7]

OR

- Q.2 (a) Explain different operations on vectors using suitable examples. [7]

- (b) Solve the following system of equations using matrices: [7]

$$x + 3y + 4z = 8; \quad 2x + y + 2z = 5; \quad 5x + y + z = 7.$$

- Q.3 (a) There are 8 male and 6 female members in a club. A committee of total 8 members is to be formed. In how many ways a committee be formed so that it includes (i) at least 3 females (ii) at most 3 males. [7]

- (b) Write an algorithm to find total number of combinations of r objects out of given n objects. [7]

OR

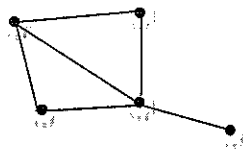
- Q.3 (a) Find n if (i) $(n + 1)! = 12 (n - 1)!$ (ii) ${}_nC_{13} = {}_nC_3$. [7]
- (b) Write an algorithm to find addition of two matrices. [7]
- Q.4 (a) Define following terms and give one example of each: [7]
- (i) Simple graph (ii) Self loop (iii) Isolated vertex
- (b) Differentiate between: [7]
- (i) Walk and Path (ii) Euler graph and Hamiltonian graph.

OR

- Q.4 (a) What is graph isomorphism? Explain by giving suitable example. [7]
- (b) Give one example of each: [7]
- (i) Euler graph (ii) Disconnected graph (iii) Labeled graph.
- Q.5 (a) Explain: (i) Hamiltonian circuit (ii) Spanning tree (iii) Cut set [14]
- (iv) Eccentricity of a vertex.

OR

- Q.5 (a) Give names to each vertex and edge of the following graph and then [7]
- find incidence matrix and adjacency matrix of the graph:



- (b) Write a short note on Konigsberg Bridge Problem. [7]
