

[Time:2.30 Hrs]

[Marks:75]

Please check whether you have got the right question paper.

- N.B:
1. All question are compulsory.
 2. Figures to the right indicate full marks.

Q.1 Attempt any four of the following 20

- Verify whether the function $f(x) = 4x+7$ defined from R to R is one-one and onto.
- Find the inverse of the functions $f(x) = 2x-1$ and $g(x) = 2-3x$. And also find $f(g(x))$.
- Let $A = \{1, 2, 3, 4, 5, 6\}$ and $R = \{(a, b): a = b \text{ mod } 2\}$. Is R an equivalence relation.
- Draw the Hasse diagram for divisibility on the set $\{1, 2, 4, 8, 16, 32, 64\}$.
- Solve recurrence relation : $a_r - 7a_{r-1} + 12a_{r-2} = 1$.
- If $A = \{1, 2, 3\}$ and $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (2, 3), (3, 1), (3, 3)\}$. Find the matrix of relation.

Q.2 Attempt any four of the following 20

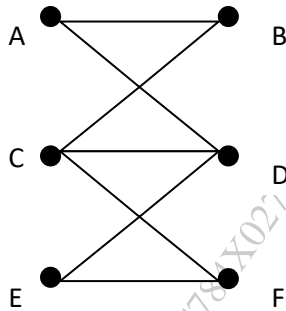
- State and prove Pascal identity.
- A club has 25 members. How many ways are there to choose four members of the club to serve on an executive committee?
- What is the coefficient of $x^3 y^4 z^2$ in $(2x - 3y + 5z)^9$?
- Using combinatorial argument prove that:
 $C(2n, 2) = 2 * C(n, 2) + n^2$.
- How many students do you need in a college to guarantee that there are at least two students who have the same first two initials?
- Find the Godel numbers of a.) 3600000 b.) 457806

Q.3 Attempt any four of the following 20

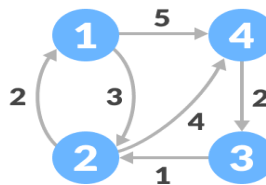
- How many edges are there in a graph with 10 vertices each of degree 6?
- Define Graph and explain its types.
- Show that the maximum number of edges in simple graph with n vertices is $\frac{n(n-1)}{2}$.
- Draw the graph represented by the following adjacency matrix.

$$\begin{matrix} a & \begin{bmatrix} 0 & 2 & 1 \\ 2 & 0 & 2 \\ 1 & 2 & 1 \end{bmatrix} \\ b & \\ c & \end{matrix}$$

E Find adjacency matrix of graph G given below:



F Find the shortest path of the following weighted graph using Warshall's algorithm.



Q.4 Attempt any three of the following

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- A Find the inverse function of $f(x) = \frac{x+1}{x-1}$, for $x \neq 1$.
- B Find the particular solution of the recurrence relation $a_n - 16a_{n-2} = 15n$.
- C Find number of integers between 1 and 1000 which are not divisible by any of 2, 3 and 7.
- D How many distinct five-persons team can be selected from a group of 12 persons.
- E Determine minimum number of vertices in a simple graph with 30 edges.
- F Find the pre order traversal for the following binary tree.

