

Instruction: 1) All questions are compulsory.
2) Each question carry equal marks.

Q 1) Solve the following (any 4)

[20]

- Prove that any two equivalence classes are either equal or disjoint.
- Solve the recurrence relation $a_n = 3a_{n-1} + 2^{n-1}$, with $a_0 = 1$, using generating function.
- Arrange the numbers 6, 7, 4, 5, 3 in ascending order using Bubble sorting algorithm.
- Solve the recurrence relation $a_n = 7a_{n-1} - 10a_{n-2}$, with $a_0 = 5$, $a_1 = 16$.
- Write a note on Tower of Hanoi.
- Let a relation R defined on Z^+ as aRb iff a/b then prove that $(Z^+, /)$ is also poset.
- Define transitive closure.

Let $A = \{1, 2, 3, 4\}$. Find the transitive closure of R whose matrix is given by

$$M_R = \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{pmatrix}$$

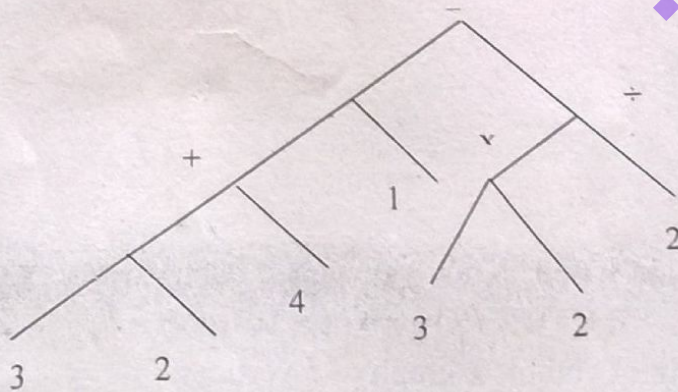
- Define the Composite relation.

Let $A = \{1, 2, 3\}$, $B = \{a, b, c\}$, $C = \{x, y, z\}$. Let $R = \{(1, b), (2, a), (2, c)\}$ from A to B and $S = \{(a, y), (b, x), (c, y), (c, z)\}$ from B to C . Find $S \circ R$, $M_{S \circ R}$. Also verify $M_{S \circ R} = M_R \circ M_S$.

Q 2) Solve the following (any 4)

[20]

- Define a tree on 5 vertices with a suitable example.
Perform a preorder, postorder and Inorder on the following tree.



- Define i) ordered rooted tree
ii) linked list representation using vertex and edge file.