

1

57959

Q. 1 Attempt All(Each of 5Marks)

(15M)

(a) Choose the best choice for the following questions:

(5 M)

- (i) b) 15
- (ii) d) none of the above
- (iii) c) {1,2,3,4}
- (iv) a) $(r^*)^* = r^*$
- (v) a) Must be even

b
d
c
a
a

(b) Fill in the blanks. Use following pool to answer question.

(5 M)

Pool(two, zero, universal, warshall's, simple, closed, equal, onto, invertible)

- (i) closed
- (ii) warshall
- (iii) onto
- (iv) zero
- (v) equal

(c) Answer the following questions:

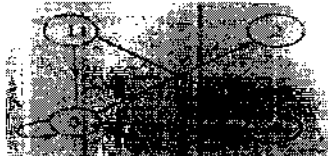
(5 M)

- (i) 20
- (ii) A graph G is said to be complete if every vertex in G is connected to every other vertex in G.
- (iii) $6!/5! = 6$
- (iv) inorder
- (v) 3

Q. 2 Attempt the following (Any THREE)(Each of 5Marks)

(15M)

- (a) yes
- (b) i) yes ii) no
- (c) iii) $\{(y,1),(z,1),(y,3),(x,4),(z,4)\}$
iv) $\text{Dom}(R) = \{1,3,4\}$ $\text{Ran}(R) = \{x,y,z\}$
- (d) i) $\{(1,2), (2,3), (3,1), (2,1), (3,3)\}$ ii) $\{(1,2)\}$ iii) $\{(2,1), (3,2), (1,3)\}$
- (e) (i) Draw its directed graph (ii) Find the matrix M_R of R



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

- (f) (i) $\{(1,3),(2,2),(3,1)\}$ (ii) $\{(1,3),(2,2),(3,3)\}$

Q. 3 Attempt the following (Any THREE) (Each of 5Marks)

(15M)

- (a) Repetition allowed = 7320
Without repetition = 4760
- (b) $5!/(2! * 2!)$
- (c) (i) 12 (ii) 18 (iii) 2
- (d) (i) 7! (ii) 6!
- (e) i) $a^3, a^2b, a^2b^2, aba, abab, a^3$ ii) $a^3, a^2b, aba^2, abab, b^2a^2, b^2ab$
- (f) $L(G) = \{a^m b^n : m \text{ and } n \text{ positive integers}\}$

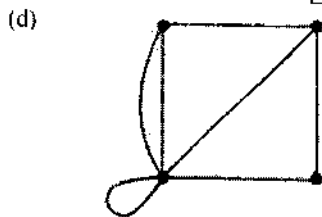
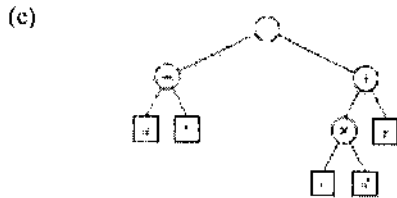
2

Q. 4 Attempt the following (Any THREE) (Each of 5Marks)

(15)

- (a) (i) They all represent the same rooted tree, that is, A is the root with children (immediate successors) B and C , and C has the single child D .
 (ii) Here T_1 and T_2 are the same ordered rooted tree but T_3 is different. Specifically, B is the first child of A in T_1 and T_2 but the second child of A in T_3 .
 (iii) They all represent different binary trees. Specifically, T_1 and T_2 are different since we distinguish between left and right successors even when there is only one successor (which is not true for ordered rooted trees). That is, D is a left successor of C in T_1 , but a right successor of C in T_2 .

(b) 4 7 2 1 5 3 8 6 9



- (e) There are two simple paths from A to C : (A, X, Y, C) and (A, X, B, Y, C)
 There is only one cycle (B, X, Y, B)

(f)

vertex	a	b	c	d	e
In degree	1	0	2	1	1
Out degree	1	2	0	1	1

(15)

Q. 5 Attempt the following (Any THREE) (Each of 5Marks)

- (a) Degree 2, -2, 4, -8, 16
 (b) 350 ways
 (c) $A = \{a, b\}$ $S = \{S_0, s_1, s_2, s_3\}$ $Z = \{x, y, z\}$ $I = s_0$
 (d) $(x+7)/3$
 (e) 33

(f) Let $A = \{a, b\}$. Construct an automaton M such that $L(M)$ will consist of those words where the number of a 's is divisible by 3. (Hint: three states are needed.)

