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S7958

**Q.1 Attempt All (Each of 5 Marks) (15M)**

(a) Select correct answer from the following:

- 1. c. Transitive
- 2. a. 6
- 3. a. adjacent
- 4. b. 7!
- 5. a digraph

- (b)
- 1. Poset
  - 2. Surjective
  - 3. Indegree
  - 4. 45
  - 5. 35

- (c) Definition
- 1. A relation which is reflexive, Symmetric and transitive is called equivalence relation.
  - 2. A term which is obtained from its previous term is called recurrence relation.
  - 3. A graph with no loops and no parallel edges is called a simple graph.
  - 4. If there are n pigeons and m pigeonholes s.t  $n > m$  then two or more pigeons can be accommodate in atleast one pigeonhole.
  - 5.  $C(n+1, r) = C(n, r) + C(n, r-1)$

**Q.2 Attempt the following (Any THREE) (15M)**

(a)

Let  $f(x) = x^2 + 3x + 2$  and  $g(x) = x^2 + 2x + 1$ .  
 Find  $(f+g)(x)$  and  $(f-g)(x)$ .

Sol: We know that  $(f+g)(x) = f(x) + g(x)$   
 Similarly,  $(f-g)(x) = f(x) - g(x)$

Therefore,  
 $(f+g)(x) = (x^2 + 3x + 2) + (x^2 + 2x + 1)$   
 $= x^2 + 3x + 2 + x^2 + 2x + 1$   
 $= 2x^2 + 5x + 3$

And,  
 $(f-g)(x) = (x^2 + 3x + 2) - (x^2 + 2x + 1)$   
 $= x^2 + 3x + 2 - x^2 - 2x - 1$   
 $= x + 1$

- (b)  $f \circ g(x) = x^2 + 3$   
 $g \circ f(x) = (x+3)^2$

(c) Define equivalence relation and let  $R = \{(1,1), (1,3), (2,2), (2,4), (3,3), (3,1), (4,4), (4,2)\}$  be the relation defined on  $A = \{1, 2, 3, 4\}$ . Show that R is an equivalence relation.

- (d) Ans:  $R = \{(1, 1), (2, 2), (3, 3), (4, 4), (1, 3), (2, 3), (3, 4), (1, 4), (2, 4)\}$
- (e)  $a_n = (1/3)2^n - (1/3)(-1)^n$
- (f) Ans:  $2^n - 1$

**Q. 3** Attempt the following (Any THREE)

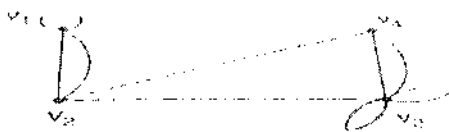
(15M)

- (a) By Kenneth.
- (b)  $7! / (2! * 2!)$
- (c) Refer Kenneth.
- (d) 3600
- (e) Let  $L = \{a, ab, a^2\}$  and  $M = \{b^2, aba\}$  be languages over  $A = \{a, b\}$ .  
Find (i) LM (ii) MM
- (f)  $L(G) = \{a^m cb^m : m \text{ non negative}\}$

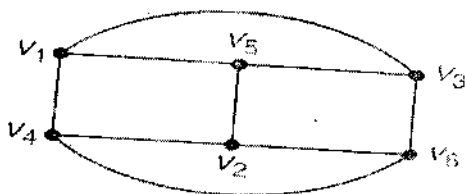
**Q. 4** Attempt the following (Any THREE)

(15)

- (a) The adjacency matrix of an undirected graph  $G$  with  $n$  vertices and no parallel edges is an  $n \times n$  matrix  $A = [a_{ij}]$  whose elements are given by  $A_{ij} = 1$  if there is an edge between  $i$ th and  $j$ th vertices and  $[a_{ij}] = 0$  if there is no edge between them.



(b)

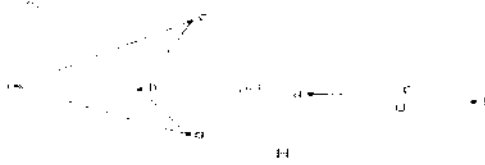


A graph or multigraph which can be drawn in the plane so that its edges do

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not cross is called planar graph.

(c) Explain the operations on graphs also find union and intersection of the given graphs.



(d)



(e) Preorder: 1 2 3 4 8 9 10 5 11 12 6 7  
Post order: 4 3 9 10 8 2 12 11 7 6 5 1  
Inorder: 4 3 2 9 8 10 1 11 12 5 6 7

(f)

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Q. 5	Attempt the following (Any THREE)	(15)
(a)	Refer Kenneth of Discrete mathematics by Kenneth	
(b)	Ans: $a_n = 2 \cdot 3^{n-1}$	
(c)	18/25	
(d)	A graph with all the vertices are connected with every other vertices of the graph is called a complete graph.	2
	Diagram of $K_5$	3
(e)	Ans: a) $L^3 = \{ababab, ababac, abcab, abc^2, cabab, cabc, c^2abc^3\}$ b) $L^{-2}$ = The negative power of a language is not defined.	