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SE-Comp
III (old)
DSDT.

12.12.2014

QP Code :12349

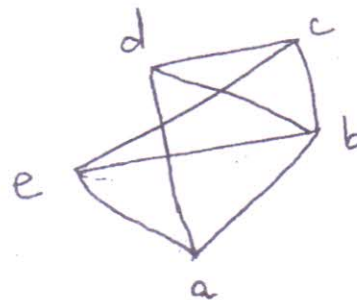
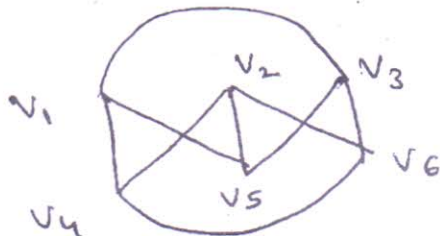
(OLD COURSE)

(3 Hours)

[Total Marks : 100

- N.B :** (1) Question No. 1 is compulsory.
 (2) Answer any **four** out of remaining **six** questions.
 (3) Assume appropriate data wherever required. State all assumption clearly.

1. (a) Use Mathematical Induction to show that :— 5
 $1+5+9+\dots+(4n-3)=n(2n-1)$
- (b) Construct the Hasse diagram of the following relation R. 5
 $A = \{1,2,3,4\}$
 $R = \{(1,1), (1,2), (2,2), (2,4), (1,3), (3,3), (3,4), (1,4), (4,4)\}$
- (c) If $A = B = C = R$ where R is a set of real number and $f : A \rightarrow B$ $g : B \rightarrow C$ are 5
 functions defined by
 $f(x) = x + 1$
 $g(x) = x^2 + 2$ then find
 (i) $(g \circ f)(x)$ (ii) $(f \circ g)(x)$.
- (d) Draw the following graphs. 5
 (i) Eulerian but not Hamiltonian
 (ii) Hamiltonian but not Eulerian.
2. (a) In a survey of 500 students it was found that 300 are locals, 300 use glasses and 8
 275 are vegetarians. 200 are locals who use glasses, 170 are locals who are veg-
 etarians, 200 of them use glasses and are vegetarians and 125 are locals who use
 glasses and are vegetarians.
 (i) Find the number of students who are not local students, who do not use
 glasses and who are not vegetarians.
 (ii) Find the number of students who are local, who do not use glasses and
 who are not vegetarians.
- (b) Are the following graphs planer? If yes show how? 6



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(c) Prove the following by Mathematical Induction :—

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$$2 + 5 + 8 + \dots + (3n - 1) = \frac{n(3n + 1)}{2}$$

3. (a) Define the following terms by giving example of illustration.

8

(i) Star Graph

(ii) Regular Graph

(iii) Complete Bipartite Graph

(iv) Pendant Vertex.

(b) Show that the set of all divisors of 70 forms a Lattice.

6

(c) Solve the recurrence relation

6

$$a_n + 3a_{n-1} + 3a_{n-2} + a_{n-3} = 0$$

$$\text{With } a_0 = 5, a_1 = -9, a_2 = 15.$$

4. (a) Let R and S be the relation on A

6

$A = \{1, 2, 3, 4\}$ defined by

$R = \{(1, 1), (3, 1), (3, 4), (4, 2), (4, 3)\}$

$S = \{(1, 3), (2, 1), (3, 1), (3, 2), (4, 4)\}$

find $R^{-1}, S^2, R \circ R^{-1}$

(b) Consider the $(2, 5)$ group encoding function $e : B_2 \rightarrow B_5$ defined by

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$$e(00) = 0 \ 0 \ 0 \ 0 \ 0$$

$$e(01) = 0 \ 1 \ 1 \ 1 \ 0$$

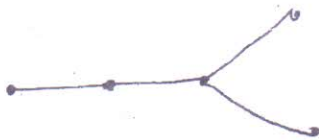
$$e(10) = 1 \ 0 \ 1 \ 0 \ 1$$

$$e(11) = 1 \ 1 \ 0 \ 1 \ 1$$

Decode the following relation to maximum likelihood decoding function.

(c) Is G_1 and G_2 Isomorphic?

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G_1

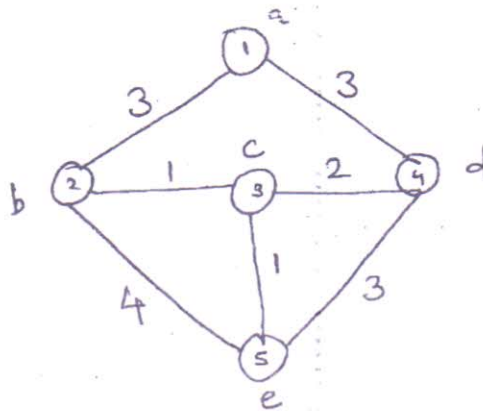


G_2

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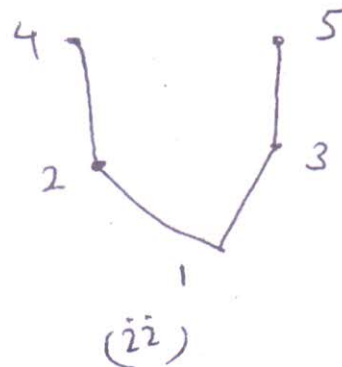
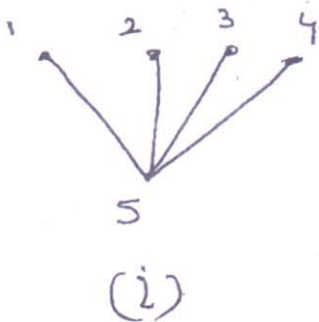
5. (a) Write english sentences corresponding to the following statement. 8
- (i) $(\sim p) \wedge q \rightarrow r$
 - (ii) $r \rightarrow (p \vee q)$
 - (iii) $\sim r \rightarrow ((\sim q) \vee p)$
 - (iv) $(\sim q \vee (\sim p)) \leftrightarrow r$
- Where P : I will study discrete structure
 q : I will go to movie
 r : I am in a good mood.

- (b) Find the minimum spanning tree of the given graph by using Prim's algorithm. 6



- (c) State and prove left or right cancellation property for a group. 6

6. (a) In any ring $(R, +, \cdot)$ prove that 6
- (i) The zero element z is unique
 - (ii) The additive inverse of each ring element is unique.
- (b) Determine the matrix of the partial order whose Hasse Diagram is given below. 6



- (c) Let $A = \{1, 2, 3, 4\}$ for the relation R whose matrix is given below. Find the matrix of a transitive closure by warshall's Algorithm. 8

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

7. (a) Prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. 6
 (b) Show that in a bounded distributive lattice, if a complement exists, it is unique. 6
 (c) A function $f : \mathbb{R} - \left\{ \frac{7}{3} \right\} \rightarrow \mathbb{R} - \left\{ \frac{4}{3} \right\}$ is defined as :— 8

$$f(x) = \frac{4x - 5}{3x - 7}$$

Prove that 'f' is bijective and find the rule for f^{-1} .

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