Code: 13A05302

R13

B.Tech II Year I Semester (R13) Supplementary Examinations November/December 2016

DISCRETE MATHEMATICS

(Common to CSE and IT)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Negate the following statements:
  (i) Ottawa is a small town.
  (ii) Every city in Canada is clean.

(b) In a set of four numbers chosen from $\{1,2,----6\}$ prove that there are two numbers whose sum is even.

(c) Represent the relation $R = \{(1,2),(1,3),(1,4),(2,3),(4,4)\}$ by a digraph.

(d) Give an example of Lattice which is not distributive.

(e) Find the order of the elements of $(Z_8, +_8)$.

(f) Prove the sum of the elements in the n^{th} row of a Pascal's triangle is 2^{n-1}.

(g) Give an inductive definition of the set $P = \{2,3,4 --------\} = N - \{0,1\}$

(h) Show that $f < x, y >= x^y$ is a primitive recursive function.

(i) Give an example of a connected graph that has Neither an Euler line non a Hamiltonian circuit.

(j) Arrange the numbers $30,36,17,20,22,32,58,19,15,50,112$ as a totally ordered set by building a binary search tree.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Establish the validity of the argument:

$$[(P \to Q) \wedge (\neg RVS) \wedge (PVR)] \to [\neg Q \to S]$$

Using the rule of contradiction.

OR

3 (a) A relation $'S'$ is defined by $a\, S\, b$. If $a^2 + b^2 = 4$ represent them as sets, find $D(S)$ and $R(S)$ if S is a relation from.
  (i) From N to N.
  (ii) From N to Z^+.
  (iii) From Z^+ to N.
  (iv) From Z to N.
  (v) From N to Z.

(b) Does the rule given by $f(x) = \frac{1}{x^2-2}$. (i) From R to R. (ii) From Q to Q.

UNIT – II

4 (a) Find the transitive closure of the Relation R which is represented by:

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

(b) Represent the relation $a\, R\, b$ if $a \le b$ in $\{1,2,3,4\}$ by their matrix and digraph.

OR

5 (a) Show that every chain is a distributive Lattice.

(b) Write the following Boolean expressions in an equivalent sum of products canonical form in three variables x_1, x_2 & x_3.
  (i) $x_1 * x_2$.
  (ii) $x_1 \oplus x_2$.

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UNIT – III

6 Show that there are only two non isomorphic groups of order 4.

OR

7 (a) Show that the set M of all matrices of the form $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$ where $n \, \varepsilon \, z$, is a semigroup under multiplication and it is isomorphic to $(z, +)$.

(b) Show that the set M of all 3×3 matrices of the form $\begin{bmatrix} 1 & m & n \\ 0 & 1 & p \\ 0 & 0 & 1 \end{bmatrix}$ where $m, n, p \, \varepsilon \, z$ is a semigroup under multiplication. Is it a monoid?

UNIT – IV

8 (a) Prove $F_{m+n} = F_{m-1}F_n + F_mF_{n+1}$ for $m, n \geq 1$ by induction.

(b) Show that $n^3 + 2n$ is divisible by 3.

OR

9 (a) Show that the function $f < x, y >= x + y$ is primitive recursive.

(b) Show that if $f < x, y >$ defines the remainder upon division of y by x, then it is a primitive recursive function.

UNIT – V

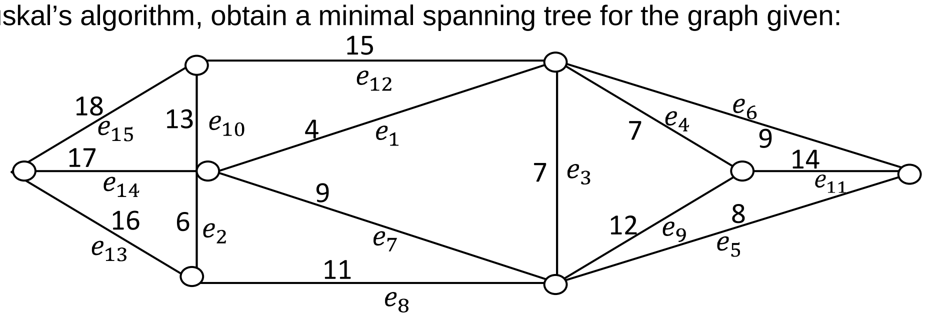
10 (a) Show that a connected graph G with 'n' vertices has at least $n - 1$ edges.

(b) Define $K - \text{regular graph}$. Give examples of $2 - \text{regular}, 3 - \text{regular}, 4 - \text{regular}$ graphs.

OR

11 (a) Express the algebraic expression $(2x - 3y)(x + 2y)^3$ in polish and reverse polish notation.

(b) Using Kruskal's algorithm, obtain a minimal spanning tree for the graph given:



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