RB-0725/300

RB-0725

Second Year B. Sc. (Computer Science) Examination

April / May – 2010

Math. : Paper - IV

(New Course)

Time : **3** Hours] [Total Marks : **105**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ **S.Y. B.Sc. (COMPUTER SCIENCE)**

Name of the Subject :
☛ **MATH. - 4 (NEW)**

☛ Subject Code No. : **0 7 2 5** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

1 Answer the following questions : **15**

(1) Define Totally ordered set with an example and draw its Hasse diagram.

(2) Let $(B, +, \cdot, ', 0, 1)$ be a Boolean algebra. Prove that $a + 1 = 1, \forall\, a \in B$.

(3) Let A be a lattice and let x, y and z be elements of A. State distributive laws for A.

(4) Define :

(a) Simple graph

(b) Euler path

(c) Connected graph.

(5) Show that energy complete graph with odd number of vertices is a Euler graph. What do you say about the converse ? Justify your answer.

2 (a) Let R be an equivalence relation on a set A and Let $E(x)$ and $E(y)$ be equivalence classes of R. Prove that $E(x) = E(y)$ if and only if xRy. **18**

(b) Define Diagraph. Let $S = \{2, 3, 4, 6, 8, 9, 12\}$ and let the relation on S be defined by xRy if x divides y. Draw the diagraph.

(c) Find the Sol^n. sets of each of the following congruence relations :

(i) $x - 3 \equiv 2 \pmod{7}$

(ii) $x + 1 \equiv 3 \pmod{5}$

OR

2 (a) Show that the relation R_5 defined as ${}_m R_5 n$ iff $m - n$ is divisible by 5 is an equivalence relation. **18**

(b) Define the following terms with illustrations :

(i) Poset

(ii) Modular lattice

(iii) Well ordered set.

(c) Let $\langle L, \leq \rangle$ be a lattice. Prove that for any $a, b, c \in L$.

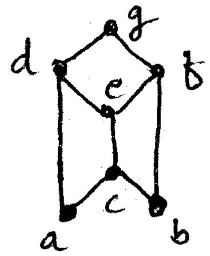
$$b \leq c \Rightarrow \begin{cases} a * b \leq a * c \\ a \oplus b \leq a \oplus c \end{cases}$$

3 (a) Show that in a lattice if $a \leq b \leq c$ then **18**

(i) $a \oplus c = b * c$

(ii) $(a * b) \oplus (b * c) = b = (a \oplus b) * (a \oplus c)$

(b) Consider the poset whose Hasse diagram is



Find lub and glb of

(i) $\{a,b\}$

(ii) $\{a, c, f\}$

(iii) $\{d, e, f\}$

(iv) $\{g, d, f\}$ if possible

(c) Prove that the complement of an element of Boolean algebra is unique.

OR

3 (a) Prove that $(mod\, m)$ relation is an equivalence relation. **18**

(b) Define complemented lattice. Show that 0 and 1 are the only complements of each other.

(c) Obtain the product of sum canonical form of the boolean expressions :

(i) $x_1 * x_2$

(ii) $x_1 \oplus x_2$

4 (a) Use K-map to find minimal sum of the following : **18**

(i) $xyz + xyz' + x'yz' + x'y'z$

(ii) $xy' + xyz + x'y'z' + x'yz'$

(b) 'Every poset is not lattice'; Explain with illustration.

(c) Let $X = \{1, 2, 3, 4\}$ and $R = \{(x, y) / x > y\}$. Draw the graph of R and also give its matrix.

OR

4 (a) Define : **18**

(i) Degree of vertex

(ii) Self loop

(iii) Adjacent Edges

(iv) Isolated vertex

(v) Hamiltonian circuit.

(b) Explain sitting problem.

(c) Can there be two isomorphic simple graphs with 6 vertices 2 of degree 5, 2 of degree 8 and 2 of degree 2 ? Draw such graphs.

5 (a) State and prove Euler's formula for planer graph. **18**

(b) Justify the statements :

(i) Every regular graph is a Euler graph

OR

(ii) Every Euler graph is a regular graph

(c) Define :

(i) Pendent vertex

(ii) Planar graph

(iii) Hamiltonian path

(iv) Euler circuit

(v) Component

(vi) Parallel edges.

OR

5 (a) A graph G is disconnected iff its vertex set V can be partitioned in to two disjoint sets v_1 and v_2 such that there is no edge in G whose are end vertex is in v_1 and the other in v_2. **18**

(b) A given connected graph has a Euler circuit iff all the vertices of G are of even degree.

(c) Show that the number of odd vertices in a graph is always even.

6 (a) Draw all rooted trees with 5 vertices.

(b) Determine the number of regions defined by a connected planar graph with 4-vertices and 8 edges. Draw such graph.

(c) Draw an arithmetic tree gives in the standard in-fix notations :

(i) $5*(7+(3-4))**3$

(ii) $\{(1+2)*[(3-4)+(1-5)]\}-[(6-3)-8]$

OR

6 (a) Explain Prim's Algorithm to obtain spanning tree with illustration.

(b) Prove that a graph is tree iff it is minimally connected.

(c) Define rooted tree, balanced tree and leaves.