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DRR-3253

Third Year B. Sc. (Sem. VI) Examination

March / April - 2016

Mathematics : MTH - 605

(Discrete Mathematics)

Time : Hours] [Total Marks : **50**

Instructions :

(1)

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

Name of the Examination :

☛ **THIRD YEAR B. SC. (SEM. VI)**

Name of the Subject :

☛ **Mathematics : MTH – 605**

☛ Subject Code No. : **3 2 5 3** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Follow usual notations.

(4) Figures to the right indicate the marks of the question.

1 Answer the following : (any **five**) **10**

(1) Prove that $b' \leq a' \Rightarrow a \leq b \Rightarrow a * b' = 0$.

(2) Define : Symmetric and Transitive relation.

(3) Prove that $< R, \leq >$ is a Lattice, where R is a relation on set of real numbers under $\leq$ (Less than or equal to)

(4) Show that I_+ be the set of all +ve integers, is a partially ordered set.

(5) In any Boolean Algebra, Prove that :

(i) $a \oplus (a' * b) = a \oplus b$ (ii) $a * (a' \oplus b) = a * b$.

(6) Write the Boolean expression $x_1 \oplus x_2$ in the product of sum canonical form containing x_3.

(7) Define: Upper bound and Lower bound of a set with one illustration.

(8) Let A = $\{2, 4, 8, 16\}$. Is $\langle A, D \rangle$ a totally ordered set under the relation '$\leq$' = 'Divides'.

2 Answer the following : (any two) **10**

(1) If R and S are reflexive, symmetric and transitive then show that $(R \cap S)$ is an equivalence relation.

(2) Let S be any set and P(s) be its Power set then prove that $\langle P(S), \subseteq \rangle$ is a lattice.

(3) Prove that a set of positive integer is a partially ordered set under the relation divides.

(4) Show that the operations meet "$*$" and Join "$\oplus$" on a lattice $\langle L, \leq \rangle$ are commutative, associative and idempotent.

3 Answer the following : (any two) **10**

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

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

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

(2) Show that every chain is a distributive lattice.

(3) Is $\langle S_{45}, Divides \rangle$ a complemented distributive lattice ?

Where S_{45} is a set of +ve divisor of 45.

(4) State and prove Isotonicity Property.

4 Answer the following : (any awo) **10**

(1) In a Boolean Algebra, Show that

(i) $a = b \Leftrightarrow ab' + ab = 0$

(ii) $a = 0 \Leftrightarrow ab' + a'b = 0$

(2) Define the sum of product canonical form. Show that

$$(x_1' * x_2' * x_3' * x_4') \oplus (x_1' * x_2' * x_3' * x_4)$$

$$\oplus (x_1' * x_2' * x_3' * x_4) \oplus (x_1' * x_2' * x_3' * x_4') = x_1' * x_2'$$

(3) Obtain the sum of product canonical form in the variables

(i) $(x_1 \oplus x_2)' * x_3$

(ii) $x_1 \oplus (x_2 * x_3')$

(4) Show that the following Boolean expressions are equivalent to each other:

(i) $(x \oplus y) * (x' \oplus 2) + (y \oplus 2)$

(ii) $(x \oplus z) * (x' \oplus y)$

5 Answer the following : (any two) **10**

(1) Use Karnaugh map to find the minimal sum of products canonical form of $f(a,b,c)=\sum(0,1,4,6)$.

(2) Use Quine-Macluskey algorithm to find the minimal sum of products of $f(a,b,c,d)=\sum(5,7,10,13,15)$

(3) Find the minimal sum of products canonical form of the Boolean function the $f(a,b,c,d)=\sum(0,2,6,7,8,9,13,15)$ by using Quine-Macluskey algorithm.

(4) Find the minimal sum of products canonical form of the Boolean function $f(a,b,c,d)=\sum(0,1,2,3,13,15)$ by using Karnaugh map.