Enrollment No: _____ **Exam Seat No:_____**

C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name : Discrete Mathematics

Subject Code : 4SC05DMC1 **Branch :**B.Sc.(Mathematics)

Semester : 5 **Date :** 29/04/2016 **Time :** 2:30 To 5:30 **Marks :** 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: **(14)**

a) Define: Equivalence relation.

b) Draw the Hasse diagram of $\langle S_8, \leq \rangle$.

c) Find the least and greatest element in the poset $\langle N, D \rangle$, if they exist.

d) Define: (i) Complement of Fuzzy subset (ii) Characteristic function

e) Define: Set of atoms

f) Prove that $ab + ab' + a' = 1$.

g) Let $\langle B, *, \oplus, ', 0, 1 \rangle$ be a Boolean algebra and $a, b, c \in B$ then show that $a * (a' \oplus b) = (a * b) \oplus (c * b * a) = a * b$.

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions

a) Let $\langle L, *, \oplus, ', 0, 1 \rangle$ be a complemented lattice and for any $a, b \in L$ then prove that $a \leq b \Leftrightarrow a * b' = 0 \Leftrightarrow b' \leq a' \Leftrightarrow a' \oplus b = 1$. **(07)**

b) For the POSET $\langle \{2, 3, 6, 12, 24, 36\}, D \rangle$ **(07)**

1) Draw the Hasse diagram.
2) Find maximal elements and minimal elements
3) Find Greatest element and least element, if exists
4) Find Lower bounds of {3,6}
5) Find Upper bounds of {6,12}

Q-3 Attempt all questions

a) Prove that $\langle P(\{a,b,c\}), \subseteq \rangle$ is a lattice and draw the Hasse diagram of it. **(07)**

b) Let be a lattice and $a,b,c \in L$, Show that the following are equivalent. **(07)**

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

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

Q-4 Attempt all questions

a) Determine whether the Boolean expressions given below are equivalent from their valuation tables. **(10)**

$f(x,y,z) = (x*y) \oplus (y*z'); \quad g(x,y,z) = (x'*y*z') \oplus (x*y*z') \oplus (x*y*z)$

b) Obtain circuit diagram representation for the Boolean expression **(04)**

$g(x,y) = (x*y') \oplus (x'*y)$

Q-5 Attempt all questions

a) For a lattice $\langle S_{90}, D \rangle$, answer the following questions: **(07)**

i) Find cover of each element and draw the Hasse diagram

ii) Find lower bound, upper bound, greatest lower bound, least upper bound of $A = \{3,5,6\}$

iii) Find the least and greatest element of it.

b) Obtain cube array representation for Boolean expression $h(x,y,z) = xy + y' + z'$ **(07)**

Q-6 Attempt all questions

a) Find the minimal sum of products expression for the function **(05)**

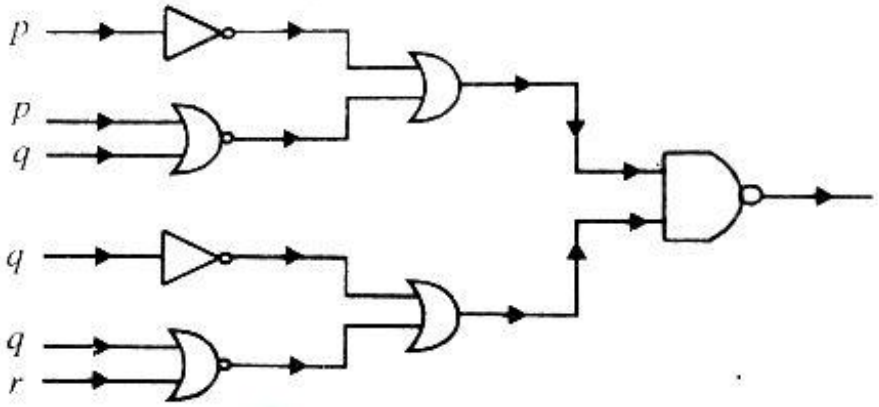
$f(a,b,c) = ab'c' + abc' + abc + ab'c + a'b'c$ by using Karnaugh map method.

b) Obtain the SOP canonical form of the Boolean expression by algebraic method in three variables $\alpha(x,y,z) = y' + \left[z' + x + (yz)' \right](z + x'y)$. **(05)**

c) Obtain the POS canonical form of the Boolean expression by algebraic method in three variables $\alpha(x,y,z) = (x+z)y$. **(04)**

Q-7 Attempt all questions

a) Simplify the circuit given in following figure using Boolean identities. **(07)**



b) Let $E=\{a,b,c,d,e\}$, $\underset{\sim}{A}=\{(a,0.3),(b,0.8),(c,0.5),(d,0.1),(e,0.9)\}$, **(07)**

$\underset{\sim}{B}=\{(a,0.7),(b,0.6),(c,0.4),(d,0.2),(e,0.1)\}$ then find the following:

1) $\underset{\sim}{A}\cup\underset{\sim}{B}$ 2) $\underset{\sim}{A}\cdot\underset{\sim}{B}$ 3) $\underset{\sim}{A}\hat{+}\underset{\sim}{B}$ 4) $\underset{\sim}{A}-\underset{\sim}{B}$ 5) $\underset{\sim}{A}\cap\underset{\sim}{B}$ 6) $\left(\underset{\sim}{A}'\right)'$ 7) $\underset{\sim}{B}'$

Q-8 State and prove Stone's representation theorem. **(14)**