



AC-3103

Second Year B. Sc. computer Science (Sem. - IV)
Examination

April / May - 2015

CCM - 402 (CS) : Discrete Mathematics

Time : Hours]

[Total Marks :

Instructions : (1)

नीचे दर्शायेख निशानीवाणी विगतो उत्तरवडी पर अवश्य कर्जवी.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
SECOND YEAR B. SC. COMPUTER SCIENCE (SEM. - IV)

Name of the Subject :
CCM - 402 (CS) : DISCRETE MATHEMATICS

Subject Code No. : 3 1 0 3 Section No. (1, 2,.....): Nil

Seat No. :

Student's Signature

- (2) All the questions are compulsory
(3) figures to the extreme right indicates full marks.

Q:1 Answer the following questions: [10]

1. Define Anti-symmetric relation with illustration.
2. Define Chain with illustration.
3. Prove that $a = b \Leftrightarrow ab' + a'b = 0$
4. Draw Hasse Diagram of $\langle S_{30}, D \rangle$
5. Define Modular and Bounded lattice.

Q:2 (A) Let S be any set and $\rho(S)$ be its power set then prove that $\langle \rho(S), \subseteq \rangle$ is a poset. [05]

OR

(A) Let $A = \{a, b, c\}$ and let $R = \{(a, b), (b, c), (c, a)\}$ then find $R \circ R$, draw the diagram for $R, R \circ R$ [05]
Also construct the relation matrix.

(B) Attempt Any two: [10]

- (1) Find the complement of elements of $\langle S_{75}, D \rangle$
- (2) Explain closure of relations in detail.
- (3) Solve the following congruence relations
 - (i) $x + 5 \equiv 4 \pmod{9}$
 - (ii) $2x \equiv 3 \pmod{5}$
- (4) Show that $\langle S_{75}, D \rangle$ is a Lattice also draw the Hasse Diagram.

Q:3 (A) If $g : L \rightarrow L$ where $\langle L, *, \oplus \rangle$ is a Lattice automorphism then prove that the image set g is a Sub lattice. [05]

OR

(A) Let (L, \leq) be a lattice. For any $a, b, c \in L$, show that the following inequalities hold: [05]

- (1) $a \oplus (b * c) \leq (a \oplus b) * (a \oplus c)$
- (2) $a * (b \oplus c) \geq (a * b) \oplus (a * c)$

(B) Attempt Any Two: [10]

- (1) Let $\langle L, \leq \rangle$ be a lattice than show that for all $a, b \in L$
 - (1) $a * b \leq a$ $a * b \leq b$
 - (2) $a \leq a \oplus b$ $b \leq a \oplus b$

(2) Prove that direct product of two lattices is again a lattice.

(3) Let $S = \{a, b, c\}$, prove that $\langle \rho(S), \subseteq \rangle$ is a Lattice .

(4) Prove that a chain of 3 or more elements is not complemented.

Q:4 (A) Define Equivalent Boolean Expression Show that $\alpha(x_1, x_2, x_3) = x_1 * (x_2 * x_3)'$ [05]

and $\beta(x_1, x_2, x_3) = (x_1 * x_2) \oplus (x_3 * x_3)'$ are equivalent.

OR

(A) Find the value of the Boolean expression $f(x_1, x_2, x_3) = \sum 0, 3, 5, 7$. Find $f(a, b, 1)$ [05]

and $(x_1 * x_2) * [(x_1 * x_4) \oplus x_2' \oplus (x_3 * x_1)']$. Find $\alpha(x_1, x_2, x_3, x_4) = \alpha(a, 1, b, 1)$

(B) Attempt Any Two [10]

(1) Explain the sum of product canonical form and find the same for $x_1 \oplus x_2$

(2) Find the value of Boolean expressions $(x_1 * x_2) * [(x_1 * x_4) \oplus x_2' \oplus (x_3 * x_2)']$ for

$$x_1 = a, x_2 = 1, x_3 = b, x_4 = 1$$

(3) Find the complement of following Boolean expressions:

(i) $xy' + x'z$ (ii) $ab' + ac + b'c$

(4) Obtain the Boolean function $f_{\alpha, \beta}: B^2 \rightarrow B$ associated with the Boolean expression

$$\alpha(x, y) = x \oplus y.$$

Q:5 (A) Let 'S' be a non-empty set and $P(S)$ be its power set then show that $\langle P(S), \cap, \cup, ', \phi, S \rangle$ is [05]
a Boolean algebra.

OR

(A) Show Karnaugh map representation of $f(a, b, c, d) = \sum (0, 1, 2, 3, 13, 15)$ [05]

(B) Attempt Any Two: [10]

(1) Obtain the product of sum canonical form of $x_1 \oplus (x_2 * x_3)$.

(2) Prove the following Boolean Identities:

(a) $a \oplus (a * b) = a \oplus b$, (b) $a * (a \oplus b) = a * b$

(3) Prove that $[a * (b' \oplus c')] * [b' \oplus (a * c)'] = a * b * c'$

(4) Find the characteristic number of following symmetric expression:

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