MCA.I/11.14.0978 Reg. No. | | | | | | | | |

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MCA DEGREE I SEMESTER EXAMINATION NOVEMBER 2014

CAS 2104 DISCRETE MATHEMATICAL STRUCTURES

(2010 Revision - Supplementary)

Time: 3 Hours Maximum Marks: 50

PART A

(Answer *ALL* questions)

$(15 \times 2 = 30)$

I. (a) Prove that $(A \cap B)' = A' \cup B'$

(b) Prove that $p \to pvq$ is a tautology.

(c) Define a Lattice.

II. (a) State the principle of inclusion and exclusion.

(b) In how many ways can 4 cards be selected from a pack of cards so as to include atleast one diamond?

(c) If $A = \{1,2,3,4,5\}$ and $R = \{(1,1),(1,2),(2,3),(3,5),(3,4),(4,5)\}$ compute R^2 and R^∞.

III. (a) Solve $a_n = 4a_{n-2}$.

(b) Find the characteristic function of reccurence relation $a_n + 6a_{n-1} + 9a_{n-2} = 9$.

(c) Find an explicit formula for the sequence defined by $a_n = 5a_{n-1} - 6a_{n-2}$ with initial conditions $a_1 = 2$ and $a_3 = 1$.

IV. (a) Obtain the disjunctive normal form of $(x' \wedge y) \vee (X \wedge z)$.

(b) Draw the circuit represented by $xy + \overline{x}y$.

(c) Prove that $a \wedge (a \vee b) = a$.

V. (a) Draw a finite automation that accept all strings of zeros and ones that starts with 111.

(b) Distinguish between deterministic and non-deterministic finite automata.

(c) Define regular language.

PART B

$(5 \times 4 = 20)$

VI. Prove by method of mathematical induction $1 + 2 + 2^2 + ... + 2^n = 2^{n+1} - 1$.

OR

VII. Convert the following argument into the language of symbols and check their validity. "Either the moon is cool or oxygen is a metal. The moon is cool. Therefore, oxygen is metal".

VIII. If $R = \{(1,4),(2,1),(2,2),(2,3),(3,2),(4,3),(4,5),(5,1)\}$ on the set $A = \{1,2,3,4,5\}$, then find $M_R, M_R{}^2$ and $M_R{}^3$.

OR

IX. State Pigeonhole principle. Find the minimum number of boys in a community to be sure that 5 of them are born in the same month.

(P.T.O.)

X. Solve the recussence relation $a_n + 5a_{n-1} + 6a_{n-2} = 3n^2 - 2n + 1$.

OR

XI. Give an explicit formula for Fibonaci sequence and solve it.

XII. Using Karnaugh Map to minimize the Boolean expression $xy + x'y + xy' + x'y'$.

OR

XIII. Simplify the Boolean expression $x'z + x'y + xy'z + yz$.

XIV. State and prove pumping Lemma.

OR

XV. Consider the finite state automaton *B* defined by the following table.

S\A	a	b	c
S_0	S_1	S_0	S_2
S_1	S_o	S_3	S_0
S_2	S_3	S_2	S_0
S_3	S_1	S_0	S_1

(i) What are the states of B?
(ii) Draw the transition diagram of B.

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