

END TERM EXAMINATION

FIRST SEMESTER [MCA] NOVEMBER-DECEMBER 2018

Paper Code: MCA-105

Subject: Discrete Mathematics

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No1 which is compulsory. Select one question from each unit.

- Q1 (a) Let Z^+ be set of +ve integers. Let R be a relation defined on Z^+ as follows $aRb \Leftrightarrow a$ divides b . Give the type of relation R.
- (b) Find the minimum number of student in a class so that two of them are born on the same day.
- (c) Prove that $p \rightarrow (p \vee q)$ is a tautology.
- (d) Let D_{105} be the set of all divisors of 105. Draw a Hasse diagram of lattice D_{105} .
- (e) Find the solution of recurrence relation $a_n = 3a_{n-1} + 1$ where $a_0 = 1$.
- (f) What are the applications of number theory in computer science?
- (g) If the permutations of the elements of $\{1,2,3,4,5\}$ are given by $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix}$ $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$ then find $\alpha\beta$.
- (h) What is semi group and how is it different from a subgroup?
- (i) What is the difference between path and circuit? When a graph is said to be Hamiltonian?
- (j) What are bipartite graphs? Is cycle $-C_6$ bipartite? (2.5x10=25)

UNIT-I

- Q2 (a) Let R be a relation on the set of real numbers such that aRb iff $a-b$ is an integer. Show that R is an equivalence relation.
- (b) Find the number of integers between 1 and 100 that are divisible by any of the integer 2,3,5,7.
- (c) What do you mean by indirect proof? Using indirect proof that "If $3n+2$ is odd, then n is odd." (4,4,4.5)

- Q3 (a) Without using truth table, prove the following:-
 $(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \equiv (p \wedge q)$
- (b) Consider the function $g: R \rightarrow R, g(x) = x^2$. Show that g is a bijection (One-One & onto). (6,6.5)

UNIT-II

- Q4 (a) Show that every finite lattice has a least upper bound and a greatest lower bound.
- (b) Simplify the Boolean functions:- (6,6.5)
 $F = x'yz + x'yz' + xy' + xy'z$
 $F = x'yz + xy'z' + xyz + xyz'$

- Q5 (a) let L_1 be the lattice D_6 (divisor of 6) = $\{1,2,3,6\}$ and let L_2 be the lattice $(P(S), C)$ where $S = \{a,b\}$. Show that two lattices are isomorphic.
- (b) Simplify $y = \sum m(0,1,2,3,4,6,8,9,10,11,12,14)$ using K-map. (6,6.5)

UNIT-III

- Q6 (a) Explain Euclidean algorithm to find the gcd of two nos by taking example.
- (b) Find the code words generated by the parity-check matrix given below.

P.T.O.

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