Registration no: | | | | | | | | | | |

Total Number of Pages: 2 **MSc.**
MMCC103

1st Semester Back Examination – 2017-18
Discrete Mathematics
Branch: M.Sc.(MC)
Time: 3 Hours
Max marks: 70
Q Code:B913
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) Prove that $\sim \forall x\ [p(x) \rightarrow q(x)] \equiv \exists x\ (p(x) \wedge \sim q(x))$.

b) Let p and q be propositions.
p : Swimming in the river is allowed.
q : Alligators have been spotted in the river.
Express the compound proposition $\sim p V (p \wedge \sim q)$ as an English.

c) Let A={a, b, c, d}. The relation R ={(a, a),(a, b),(b, c)} is defined on A. Find R^2 .

d) What do you mean symmetric closure of a relation ?

e) What is method of Principle of Inclusion-Exclusion ?

f) Describe handshaking theorem.

g) What is a Hamiltonian graph ? Give example of a Hamiltonian graph.

h) Is there any Boolean algebra having nine elements ? Justify your answer. chromatic number.

i) Define Ring, Division Ring and Integral Domain.

j) For any two elements a, b of a lattice, show that $a\, V\, b = b\ iff\ a \leq b$.

Q2 **a)** Prove that if n is positive integer, then n is even iff 7n+4 is even. **(5)**

b) Prove by Mathematical Induction that for n≥4, $n^3 < 3^n$. **(5)**

Q3 **a)** Solve the following recurrence relations **(5)**
$a_n = -3a_{n-1} - 2a_{n-2}$ with the initial condition $a_0 = -2, a_1 = 4$.

b) Solve the recurrence relation by generating function method **(5)**
$a_n = 5a_{n-1} - 6a_{n-2}$ with initial conditions $a_0 = 6, a_1 = 30$.

Q4 **a)** Let R be a relation from a non-empty set A to a non empty set B and S be a relation from a non-empty set B to a non empty set C. Show that $(RoS)^{-1} = R^{-1} o\ S^{-1}$. **(5)**

b) Using Warshall algorithm, find all the transitive closure of **(5)**

$$M_R=\begin{bmatrix}1 & 0 & 0 & 1\\ 0 & 1 & 1 & 0\\ 0 & 1 & 1 & 0\\ 1 & 0 & 0 & 1\end{bmatrix}$$

Q5 **a)** Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7. Also indicate how many are divisible 3 or 7 but not by 5 and divisible by 3 or 5. **(5)**

b) If $e > \frac{1}{2}(n-1)(n-2)$ then a simple graph with n vertices and e edges are connected. **(5)**

Q6 **a)** Let G be a connected plannar simple graph with 'e' edges and 'v' vertices. Then v – e + r = 2, where r is the number of regions in G.. **(5)**

b) Define a tree. Write the algorithms of postorder, preorder traversal of tree.. **(5)**

Q7 **a)** Let G be an abelian group with identity element e and H ={x:x^2=e} then show that H is a sub group of G. **(5)**

b) Let $f: G \to G'$ is a group homomorphism. Then show that f(e)=e' for e ϵ G, e' ϵ G' and $f(a^{-1}) = (f(a))^{-1}\ \forall\ a \in G$ **(5)**

Q8 **a)** Show that the set $Z_7 = \{0,1,2,3,4,5,6\}$ forms a ring under addition and multiplication modulo 7. **(5)**

b) Let L be a lattice. Then for any a, b ϵ L, show that **(5)**

i) a V(a Λ b) = a

ii) a Λ(a V b) = a