Roll No. **Total No. of Pages : 03**

Total No. of Questions : 09

MCA (2012-Batch) (Sem.–2nd)

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code : MCA-201

Paper ID : [B0133]

Time : 3 Hrs. **Max. Marks :100**

INSTRUCTION TO CANDIDATES :

1. **SECTIONS-A, B, C & D contains TWO questions each carrying TWENTY marks each and students has to attempt any ONE question from each SECTION.**
2. **SECTION-E is COMPULSORY carrying TWENTY marks in all.**
3. Use of non-programmable **scientific calculator** is allowed.

SECTION-A

ce between a simple and multigraph by giving an

(b) Define the chromatic number of a graph. Find the chromatic number of $K_{m,\,n}$, the complete bipartite graph on m and n vertices respectively.

2. (a) A connected multigraph has an Euler circuit. Prove that each of its vertices has even degree.

(b) Define a Hamiltonian, circuit in a graph. Give an example of a graph which has a Hamiltonian circuit and an example of a graph which does not have a Hamiltonian circuit.

SECTION-B

3. (a) Draw the directed graph of the relation

$A = \{(1, 1), (1, 3), (2, 1), (2, 3), (2, 4), (3, 1), (3, 2), (4, 1)\}$

on the set $\{1, 2, 3, 4\}$. Use this digraph to determine whether R is reflexive, symmetric and/or transitive.

(b) Define a countable set and an uncountable set. Prove that a countable set can not be equivalent to an uncountable set.

4. (a) Find the partition of the set of integers given by the equivalence relation congruent module 5.

   (b) State and prove De Morgan's laws for the two sets A and B.

SECTION-C

5. (a) Prove by the method of mathematical induction that $2^n < n\,!$ for every positive integer $n \geq 4$.

   (b) Prove that the propositions $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

6. (a) Show that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tantology.

   (b) What are the negations of the statements. $\forall x\ (x^2 > x)$ and $\exists\ x\ (x^2 = 2)$?

SECTION-D

7. dan method, find the inverse of the matrix :

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

   (b) If $A = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$,

   Compute AB and BA and show that $AB \neq BA$.

8. (a) Determine the rank of the matrix :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$$