Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

MCA (2013 and 2014 Batch) (Sem.–2)

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code : MCA-201

Paper ID : [B0133]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS 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 consisting of TEN questions carrying TWENTY marks in all.**
3. Use of non-programmable **scientific calculator** is allowed.

SECTION–A

Q1 Define directed and undirected graphs. Prove that an undirected graph possesses an Eulerian circuit if it is connected and its vertices are all of even degree and also give example.

Q2 a) State and prove Five color theorem.

b) Explain the shortest path problem and also explain the algorithms used to find shortest path.

SECTION-B

Q3 a) Show that $A \cup (B \cup C) = (A \cup B) \cup C$.

b) State and prove De-Morgan's law.

Q4 a) Define Minsets. Let B_1, B_2, B_3 are the subsets of a universal set U. Find all minsets generated by B_1, B_2 and B_3.

b) Define Partitions of sets. Give all the partitions of {1, 2, 3, 4}.

SECTION-C

Q5 a) Test the validity of: If he works hard then he will be successful. If he is successful then he will be happy. Therefore, hard work leads to happiness.

b) Prove that conjunction distributes over disjunction.

Q6 a) Use Mathematical induction to show that $1.2 + 2.3 + \cdots\ldots \ldots + n(n+1) = \frac{n(n+1)(n+2)}{3}$.

b) Define Quantifiers. Explain different types of quantifiers along with examples.

SECTION-D

Q7 Solve by Gauss Elimination method : $2y + z = -8,\ x - 2y - 3z = 0,\ -x + y + 2z = 3$

Q8 Solve by matrix inversion method : $7x + 2y + z = 21,\ 3y - z = 5,\ -3x + 4y - 2z = -1.$

SECTION-E

Q9 Answer briefly :

a) Define Chromatic number and vertex coloring.

b) Define Euler and Hamilton graphs.

c) Define Union of two sets and give example.

d) Can we say that Cartesian product is commutative? Justify.

e) Define Countable set.

f) Define tautologies and contradictions.

g) Prove that $p \vee q = q \vee p$.

h) Define Symmetric and Skew-Symmetric.

i) If $A = \begin{bmatrix} -2 & -1 \\ 3 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, Find AB.

j) Define Rank of a Square matrix and find the rank of $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$.