

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 Differentiate between the following :

- a) Simple and multigraphs
- b) Directed and undirected graphs
- c) Eulerian and Hamiltonian graphs

Q2. Explain the algorithm for finding the shortest path in a graph.

SECTION-B

Q3 Suppose there are 1800 students in a college. The number of students studying biology is 240 and the number of students studying Mathematics is 210. The number of students studying Physics is 400. The number of students studying Mathematics or Physics is 570. The students studying Mathematics do not study Biology. Rest of the students are studying Arts subjects. Find the number of students studying : (a) Mathematics and Physics ; (b) Arts subjects.

Q4. Define an Equivalence relation. On the set Z, relation R is defined by aRb if and only if $ab > 0$, then prove that R is an equivalence relation.

SECTION-C

Q5. Using the principle of mathematics induction, prove that :

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left\{ \frac{n \times (n + 1)}{2} \right\}^2 \text{ for all } n \in \mathcal{N}.$$

Q6. Find whether the following are tautology or not without using truth table.

a) $(p \downarrow q) \leftrightarrow (\quad p)$

b) $(p \vee (p \wedge q)) \leftrightarrow p$

SECTION-D

Q7. What is a Matrix? What are the types of matrices? Discuss matrix addition, scalar multiplication and multiplication of matrices by taking suitable example.

Q8. Solve the following set of simultaneous algebraic equations using the Gauss elimination method :

$$6x_1 + 12x_2 + 2x_3 = 32$$

$$4x_1 + 8x_2 + 6x_3 = 26$$

$$2x_1 + 6x_2 + 4x_3 = 18$$

SECTION-E

Q9. Answer briefly :

- Define complement of a set.
- Let A and B be any two sets, then prove that $(A - B) \cap B = A \cap B$.
- State De-Morgan's laws.
- What is a Relation?
- State graph coloring problem.
- Give an example of a relation which is reflexive symmetric but not transitive
- What are basic connectives?
- If $A = \begin{pmatrix} 2 & 3 \\ 6 & 7 \end{pmatrix}$. Find $A + A^T$.
- What are Quantifier? Give examples of each quantifier.
- Define a connected graph.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.