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Total No. of Pages: 02
Total No. of Questions: 09

MCA (Sem.-2nd)
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code: MCA-201

Paper ID: [B0133]

Time: 3 Hrs.

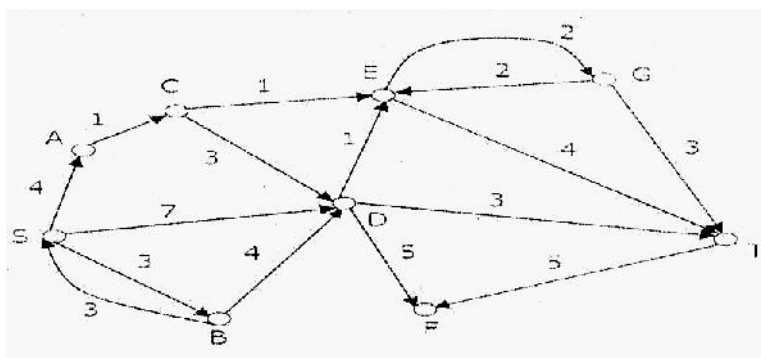
Max. Marks: 60

INSTRUCTIONS TO CANDIDATE:

1. Sections- A, B, C & D contains two questions each carrying ten marks. Attempt any one.
2. Section-E is compulsory
3. Use of non-programmable scientific calculator is allowed.

SECTION-A

- Q. 1.** Find shortest path from S to T using Dijkstra's Algorithm. (10)



- Q. 2.** Prove that the maximum degree of any vertex in a simple graph having n vertices is n-1 (10)

SECTION-B

- Q. 3.(a)** In a class of 60 boys, there are 45 boys who play cards and 30 boys play carom. Find
- (i) How many boys play both games? (5)
 - (ii) How many boys play cards only?
 - (iii) How many boys play carom only?
- (b) Let $A = \mathbb{Z}^+$, the set of all positive integers, and let $R = \{(a, b) \in A \times A \mid a \text{ divides } b\}$. Is R symmetric asymmetric or antisymmetric? (5)
- Q. 4.(a)** Let $A = \{1, 2, 3\}$, $B_1 = \{1, 2\}$ and $B_2 = \{2, 3\}$ (5)
- (i) Find minsets generated by B_1 and B_2 .
 - (ii) Do minsets form a partition of A. Check?
- (b) Let $X = \{1, 2, 3, 4\}$ and $R = \{ \langle x, y \rangle \mid x > y \}$. Draw the graph of R and also give its matrix. (5)

SECTION-C

Q. 5. Demonstrate the implication: $(x)(P(x) \rightarrow Q(x), (x)(Q(x) \rightarrow R(x)) \Rightarrow P(x) \rightarrow R(x)$ (10)

Q. 6. Let P be the statement “the south-west monsoon is very good this year” and Q be the statement “the rivers are rising”, Give the verbal translation for

(i) $PA \sim Q$ (ii) $\sim (\sim PV \sim Q)$. (10)

SECTION-D

Q. 7. Let $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$, Find A^{-1} (10)

Q. 8. Solve the linear eqs. by Gauss elimination method: $x+y+z=3$; $x+2y+2z=5$; $3x+4y+4z=11$. (10)

SECTION-E

(Compulsory)

(10x2=20)

Q. 9. Write Briefly:

- (a) Define equivalence relation with example.
- (b) Let $A=\{1, 2, 3, 4\}$, Give an example of a relation on A which is both an equivalence relation and a partial order relation.
- (c) How many edges are there in a graph with 12 vertices each of degree 6?
- (d) Define complement of a set. Explain with example.
- (e) Define rank of a square matrix.
- (f) Let $A=\{1, 2, 3, 4\}$, and R is a relation defined by “a divides b”. Write R as a set of ordered pair, draw directed graph. Also find R^{-1} .
- (g) Define Eulerian Graph and prove that a non empty connected graph G is Eulerian iff its vertices are all of even degree.
- (h) Write the following statement in symbolic form using quantifiers: All students have taken a course in mathematics.
- (i) Is the following argument valid?
If taxes are lowered, then income rise
Income rise
 $\therefore$ Taxes are lowered
- (j) State and prove De Morgan’s law for logic.

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