

2018

MCA 1st Semester Examination
COMPUTATIONAL MATHEMATICS

PAPER—MCA-102

Full Marks : 100

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

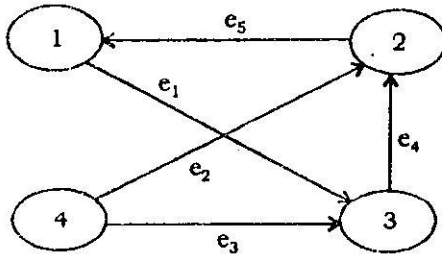
Answer Q. No. 1 and any four from the rest.

1. Answer any five questions : 5×2
- (a) Define Euler graph.
 - (b) Find the power set of the set $A = \{\emptyset\}$.
 - (c) Define spanning tree.
 - (d) What is symmetric relation? Give example.
 - (e) What is finite and infinite set?

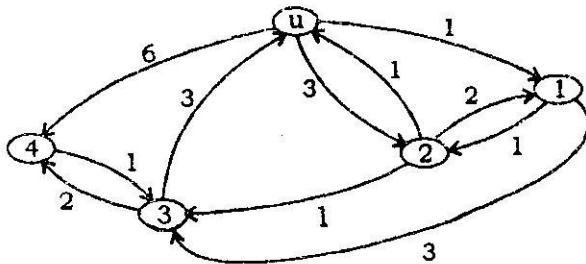
(Turn Over)

- (i) Given a recursive function $f_n = 3f_{n-1} - 2f_{n-2}$ for $n > 2$ and given $f_1 = 0$ and $f_2 = 2$, then find f_6 ?
- (g) Define Hamiltonian path.

2. (a) Construct adjacency matrix from the following graph :



- (b) Write down the principle of adjacency matrix.
- (c) Define tree. Describe the Prim's algorithm to find the minimum spanning tree. (3+2)+(2+8)
3. (a) Using Dijkstra's algorithm find the shortest path from vertex U to vertex 4.



- (b) Explain the DFS algorithm with proper example. 7+8

4. (a) What is equivalence relation? Consider the set $\{a, b, c\}$. Find its equivalence relation.
- (b) Obtain the Venn diagrams for the following sets :
 (i) $A - B$ (ii) $A^c \cap B$ (iii) $A \Delta B$ (iv) $(A \Delta B)^c$ (v) $A^c \cup B^c$
 $(2+3)+(2 \times 5)$
5. (a) Let $K = \{a, b, c\}$ and $L = \{1, 2, 3\}$. Find $K \times L$ (Cartesian product of two sets).
- (b) Explain the principle of inclusion and exclusion.
- (c) In a fruit feast among 200 students, 88 choose to eat durians, 73 ate mangoes and 46 ate litchis, 34 of them had eaten both durians and mangoes, 16 had eaten durians and litchis and 12 had eaten mangoes and litchis, while 5 had eaten all 3 fruits. Determine, how many of the 200 students ate none of the 3 fruits and how many ate only mangoes?
 $5+3+7$
6. (a) Define bijection, injection and surjection.
- (b) What is pigeonhole principle? A bag contains 10 red marbles, 10 white marbles and 10 blue marbles. What is the minimum no. of marbles you have to choose randomly from the bag to ensure that we get 4 marbles of same color?
- (c) Prove that $\overline{(A - B) - (B - C)} = \overline{A} \cup B$ using set identities.
 $3 \times 2 + (3+3) + 3$

7. (a) Show that the maximum no. of edges in a simple graph is $n(n - 1)/2$.
- (b) What is isomorphic graph ? Give example.
- (c) What is planar graph ?
- (d) Prove that a tree with n vertices has $n - 1$ edges.

6+3+2+4

[*Internal Assessment : 30*]
