MCA 1st Semester Examination, 2019

MCA

PAPER —MCA-102

Full Marks : 100

Time : 3 hours

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

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

1. Answer any *five* questions :   2 × 5

   (*i*) How many edges are there in a graph with 10 vertices, each of degree 6 ?

   (*ii*) Define isomorphism with example.

   (*iii*) Construct a string of length 8 that ends with 00.

(*iv*) Define Power set.

(*v*) Define universal quantifier and existential quantifier.

(*vi*) Show that

$$P \rightarrow Q \equiv \sim P \vee Q$$

by truth table.

2. (*i*) Prove the following argument - Anyone perform well is either intelligent or a good actor. If someone is intelligent, then he/she can count from 1 to 100. Peter performs well. Peter can only count 1 to 7. Therefore, not everyone is both intelligent and a good actor.

(*ii*) Show that

$$P \rightarrow (Q \rightarrow (R \rightarrow (\sim P \rightarrow (\sim Q \rightarrow \sim R))))$$

is a tautology.

$$10 + 5$$

3. (*i*) Prove that,

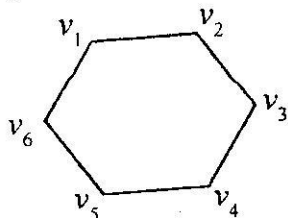$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$$

(*ii*) List the elements of

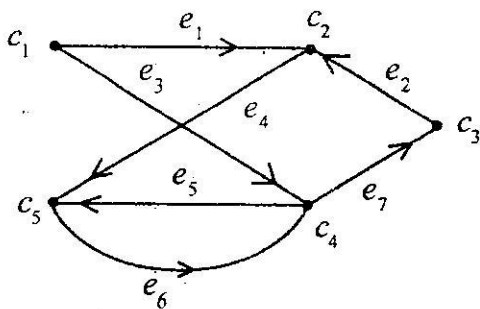$$\{1, 2, 3, 4\} \cup \{2, 3, 5, 7\} \cup \{1, 5, 9\}.$$

(*iii*) What is inverse function ? Give example.

(*iv*) How many bit strings of length 8 either start with a 1 or end with 00 ? $5 + 2 + 3 + 5$

4. (*i*) What is bipartite graph ? Is the following graph bipartite ?

(*ii*) Show the adjacency matrix and incidence matrix of the following graph.

(*Turn Over*)

(iii) Explain one graph shortest path problem with proper example.   5 + 5 + 5

5. (i) Define pigeonhole principle.

(ii) A Soccer club has 8 female and 7 male members. For today's match, the coach wants to have 6 female and 5 male players on the grass. How many possible configurations are there ?

(iii) Twenty nine children went to a zoo to photograph some animals. The numbers of children who photographed Lions (L), Monkeys (M) and Zebra (z) are given as follows :

- 6 of the children photographed all three
- 9 photographed Lions and Zebras
- 2 photographed Monkeys and Lions but not Zebras
- 3 photographed Lions only
- 4 photographed Monkeys only
- 10 photographed Zebras only

Draw the venn diagram to show the information. All of the children photographed at least one of the three types of animal. $3 + 5 + 7$

6. Define with example : 3×5

(*i*) In-degree and out-degree of vertex

(*ii*) Pendant vertex

(*iii*) Wheel of a graph

(*iv*) *n*-cube

(*v*) Connected graph.

7. (*i*) What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$?

(*ii*) Define Pascal's triangle with example.

(*iii*) Test the validity of the following argument :

If milk is black then every cow is white. If every cow is white then it has four legs. If every cow has four legs then every

buffalo is white and brisk. The milk is black.
Therefore, the buffalo is white.   4 + 3 + 8

[*Internal Assessment* : 30 Marks]

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