

## MCA (Revised)

## Term-End Examination

## MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 Hours]

[Maximum : Marks : 50

**Note:** Attempt any three questions from the rest. Question No. 1 is compulsory.

1. (a) A person climbs a staircase by climbing either (i) two steps in a single stride or (ii) only one step in a single stride. Find the recurrence relation of No. of ways of climbing  $n$  stairs. 4

- (b) Find the order and degree of the following recurrence relation:

(i)  $a_n = 5a_{n-1} + n^3$

(ii)  $a_n = 5a_{n-1} a_{n-2}$

Also determine whether the Recurrence Relation is linear homogeneous with constant coefficient or not. 6

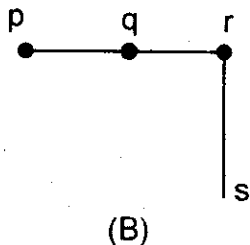
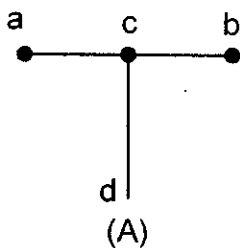
- (c) Find the generating function of the following sequence: 2

$$bn = n + 1$$



(d) A graph consists of four vertices each of degree three and an isolated vertices. Find the No. of edges. 4

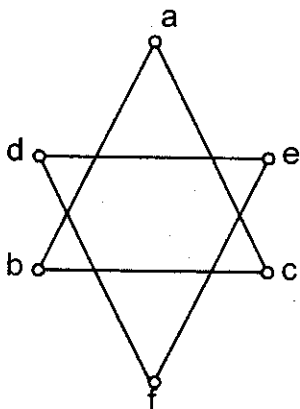
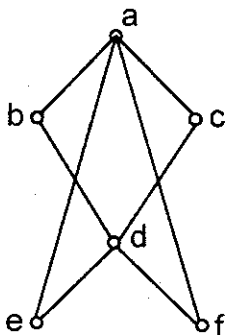
(e) Examine whether the following graph shown in the fig. are iso-morphic or not? 4



2. (a) If  $G$  is connected planar graph has  $n$  vertices,  $e$  edges and  $r$  regions, then prove that: 5

$$n - e + r = 2$$

(b) Show that the graph given in the figure are planar or not: 5



3. (a) Prove that the complete graph  $Kn$  is strongly regular for any  $n$ . 5
- (b) Find the chromatic number of the following graph with justification: 5
- (i) a complete graph ( $K_5$ )
- (ii) a bipartite graph ( $K_{3,4}$ )

4. Solve the following recurrence relation:

(a)  $a_n - 7a_{n-1} + 10a_{n-2} = n \cdot 4^n$  5

(b) Using generating function solve the following recurrence relation:

$$a_n - a_{n-1} - 6a_{n-2} = 0$$

given  $a_0 = 2$   $a_1 = 1$  5

5. (a) Find the number of integer solution to  $a_1 + a_2 + a_3 = n$  where  $-1 \leq a_1 \leq 1$ ,  $1 \leq a_2 \leq 3$  and  $a_3 \geq 3$ . 5

(b) Solve the following recurrence relation using substitution method: 5

$$a_n = 6a_{n-1} - 8a_{n-2}; a_0 = 1 \text{ and } a_1 = 0$$

—x—