

**MASTER IN COMPUTER
APPLICATIONS (MCA)
(REVISED)**

**Term-End Examination
June, 2022**

**MCS-033 : ADVANCED DISCRETE
MATHEMATICS**

Time : 2 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory.*

(ii) *Answer any **three** questions from the rest.*

1. (a) Find the order and degree of the following recurrence relations : 4

(i) $a_n = a_{n-1}^2 + a_{n-2} a_{n-3} a_{n-4}$

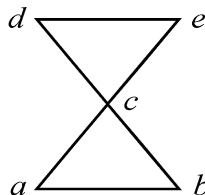
(ii) $a_n = \sqrt{a_{n-1}} + a_{n-2}^2$

(b) Solve the following recurrence relation using characteristic equation : 5

$$t_n = 4t_{n-1} - 3t_{n-2} \quad \text{for } n > 1,$$

$$t_0 = 0, t_1 = 1.$$

- (c) What is generating function ? Define exponential generating function. 4
- (d) Is every subgraph of a regular graph, regular ? Give reasons for your answer. 4
- (e) Show that K_5 is not a planar graph. 3
2. (a) What is bipartite graph ? What is the chromatic number of any bipartite graph ? Show that C_6 is a bipartite and K_3 is not a bipartite graph. 6
- (b) Draw at least *two* non-isomorphic graphs on four vertices. 4
3. (a) Solve the following recurrence relation using substitution method : 6
- $$a_n = a_{n-1} + 2, \quad n \geq 2$$
- Subject to the initial condition $a_1 = 3$.
- (b) Construct a non-Hamiltonian graph on five vertices. 4
4. (a) Define the complement of a graph. Draw the complement of the given graph : 4



[3]

(b) Solve the recurrence relation : 6

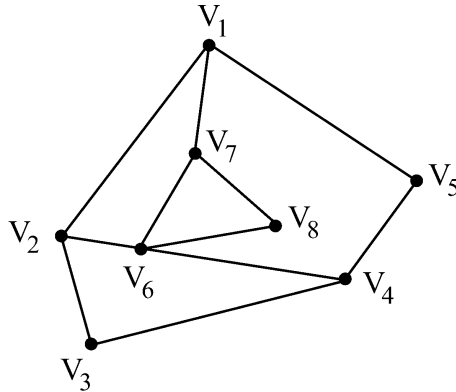
$$6a_n - 7a_{n-1} + a_{n-3} = 4, \quad n \geq 3$$

if $a_0 = 14$

$$a_1 = 1$$

$$a_2 = 5.$$

5. (a) Consider the following graph : 6



(i) Find $\delta(G)$ and $\Delta(G)$.

(ii) Draw a spanning tree of the graph.

(iii) Find a Euler path in the graph, if any.

(b) State Dirac's and Ore's theorems. 4