

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

Term-End Examination

June, 2024

**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 relation. Determine whether they are homogeneous or non-homogeneous. 4

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

(ii) $S_n = S_{n-1}^2 + S_{n-2}S_{n-3}$

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

$$a_n - 9a_{n-1} + 20a_{n-2} = 0 \text{ for } n \geq 2$$

$$a_0 = -3 \text{ and } a_1 = -10$$

(c) What is Tower of Hanoi problem ? Find the recurrence relation for this problem. 5

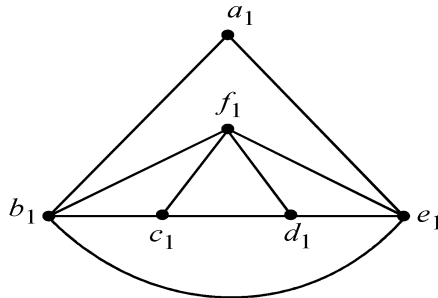
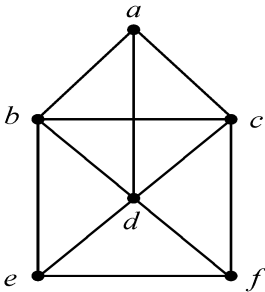
(d) Prove that if W is a $u - v$ walk joining two distinct vertices u and v , then there is a path joining u and v contained in the walk.

6

2. (a) State and prove handshaking theorem. 4

(b) Differentiate methods of inspection and telescoping sums on relevant attributes. Give one example for each. 6

3. (a) Show whether the following graphs are isomorphic or not. Justify : 5



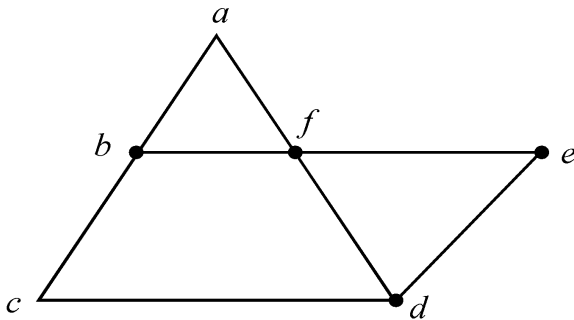
(b) Solve the following recurrence relation : 5

$$a_n - 5a_{n-1} + 6a_{n-2} = 0$$

where $a_0 = 2, a_1 = 5$.

[3]

4. (a) Build a generating function for the geometric progression $\{ar^n, n > 0\}$ i. e. $\{a, ar, ar^2, \dots\}$. 6
- (b) Draw the complement of the following graph : 4



5. (a) Define a regular graph. For which value of n the following graphs are regular : 5
- (i) K_n
- (ii) C_n
- (b) Solve the following recurrence relation : 5

$$a_n = a_{n-1} + 5^n, \quad a_0 = 1$$