No. of Printed Pages : 4 **MCS–033**

MASTER IN COMPUTER APPLICATIONS (MCA) (REVISED)

Term-End Examination

December, 2023

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. Determine whether they are homogeneous or non-homogeneous : 4

(i) $a_n = n\,a_{n-1} + (-1)^n$

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

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

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

with initial condition $a_0 = 1, a_1 = -1$.

(c) Explain how power series can be used as a generating function for a sequence of real numbers. 3

(d) Let G be a graph with n vertices and $(n-1)$ edges. Then prove that the following two statements are true : 4

(i) G is a tree

(ii) G has no cycles

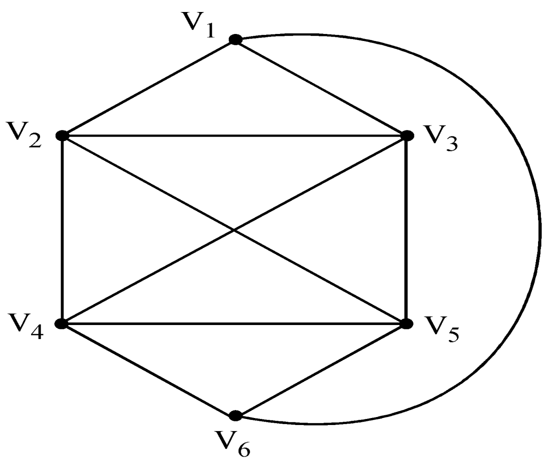
(e) Define chromatic number of a graph. Construct a graph with chromatic number 5. 4

2. (a) Describe the following methods to solve recurrence relation : 4

(i) Method of Inspection

(ii) Method of Telescopic sum

(b) Define Eulerian circuit. Is there any Eulerian circuit existing in the following graph ? Is the following graph edge traceable ? Justify.



3. (a) Solve the following recurrence relation using the characteristic equation : 5

$$a_n^2 - 2a_{n-1}^2 = 1 \text{ for } n \geq 1, a_0 = 2$$

(b) State Euler's formula for a planar graph. Give an example of a planar graph with five vertices and five regions and verify Euler's formula for your example. 5

4. (a) State Dirac's and Ore's theorems. Justify that Dirac's theorem follows Ore's theorem. 5

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

$$a_n = 3a_{n-1} + 1,\ a_0 = 1$$

5. (a) A person deposits ₹ 35,000 in a bank in a savings account as a rate of 7% per annum. Let p_n be the amount patyable after n years. Design a recurrence relation to formulate the problem. Also using the recurrence relation, find the amount payable after 6 years. 6

(b) Define an independent set. Find two different maximal independent sets in the following graph : 4