

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

Term-End Examination

June, 2026

**MCS-033 : ADVANCED DISCRETE
MATHEMATICS**

Time : 2 Hours

Maximum Marks : 50

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

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

1. (a) $a_n = a_{n-1}^2 + a_{n-2} a_{n-3} a_{n-4}$, check whether
it is homogenous or not, also find the
degree and order of the above
differential equation. 3

- (b) Find all solutions of the recurrence relation : 5

$$a_n - 2a_{n-1} = 2n^2 \quad n > 1$$

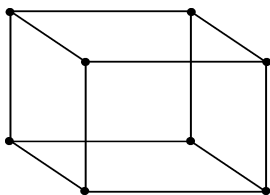
$$a_1 = 4$$

- (c) Verify that the following degree sequence of the graph is possible or not :

3

$$6, 6, 6, 6, 3, 3, 2, 2$$

- (d) Is the following hypercube Q_3 planar ? Explain. Also, describe the hypercube and planar graph. 5

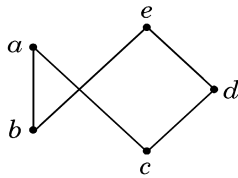


- (e) Determine the number of Integer solutions to the following linear equation using Power series method : 4

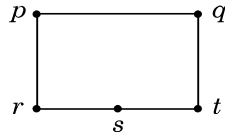
$$X_1 + X_2 = 3, \text{ with } 0 \leq X_1 \leq 1 \text{ and}$$

$$0 \leq X_2 \leq 2$$

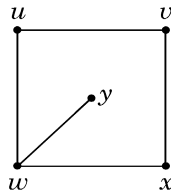
2. (a) Explain Isomorphism. Which of the following graphs (I, J, K) are isomorphic ? Justify. 5



(I)



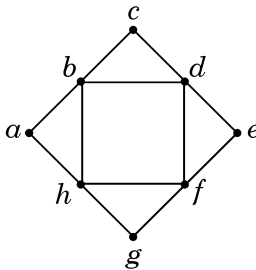
(J)



(K)

- (b) Prove that a connected graph G is Euler graph if and only if every vertex of G is of even degree. 5

Is the following graph a Euler graph ? Verify.



3. (a) Describe Hamiltonian Graphs. Write Dirac's criteria and Ore's criteria to verify whether a graph is Hamiltonian or not. 5
- (b) What are bipartite graph ? What are their applications ? Find the maximum no. of edges in a bipartite graph of n vertices. 5
4. (a) Explain the following in the connected graph with the help of an example for each : 6
- (i) Path
- (ii) Circuit
- (iii) Cycle
- (b) If the number of edges in a graph $G = 13$ and the number of edges in its complement $G^C = 15$ then, what is the total number of vertices in G ? 4

5. (a) Use generating function to solve the recurrence relation : 4

$$a_n + 3a_{n-1} - 4a_{n-2} = 0 \quad n \geq 2$$

given that $a_0 = 3, a_1 = -2$.

- (b) Write short notes on any *two* of the following : 6

- (i) Travelling Salesperson Problem
- (ii) Spanning Tree
- (iii) Vertex Colouring

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