

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

Term-End Examination

December, 2025

**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) Write the recurrence relation for the Fibonacci series. 2
- (b) Verify that $2^{n+1} - n - 2$ is the solution of the recurrence relation : 4
- $$T(n) = 2T(n - 1) + n \quad n \geq 2$$
- $$T(1) = 1$$
- (c) What is planar graph ? Prove that K_4 is a planar graph. 4

- (d) Verify that the following degree sequence of the graph is not possible : 4

3, 2, 1, 1, 0

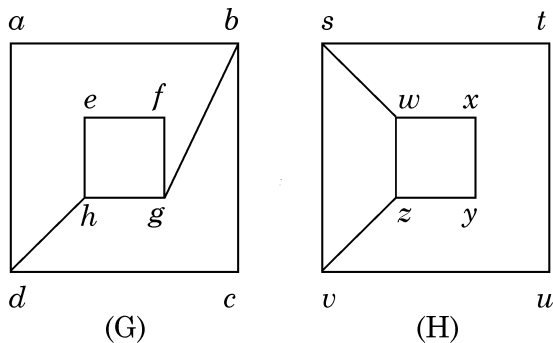
Justify with suitable argument.

- (e) Find the generating function of the Geometric Progression. 4

- (f) Determine the order and degree of the recurrence relation : 2

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

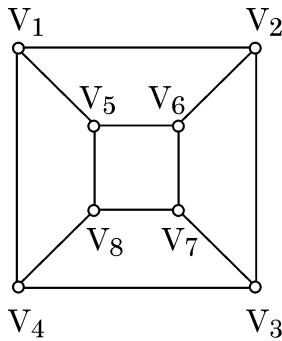
2. (a) What is Isomorphism ? Write the conditions for the graphs to be isomorphic. Show that the following graph G and H are not isomorphic : 5



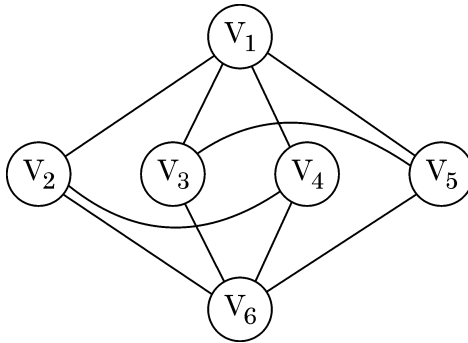
- (b) Describe the term 'Complement of a Graph G' with suitable diagram. If $G(V, E)$ is a (p, q) graph, then determine

the number of vertices and number of edges in the complement of the Graph G. 5

3. (a) Give the definition of Hamiltonian graph. Is the graph given below Hamiltonian or not ? Justify. 5



- (b) Define chromatic number for a graph : 3



Find the chromatic number of the above graph.

- (c) Differentiate between a tree and a spanning tree. 2
4. (a) Solve the recurrence relation : 6

$$a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$$

with $a_0 = 5, a_1 = -9, a_2 = 15.$

- (b) What is a graph ? Is tree a graph ? Explain. 4
5. Write short notes on the following : $2\frac{1}{2} \times 4 = 10$
- (a) Generating functions
- (b) Method of inspection of solving recurrences
- (c) Open and closed walk of a graph G
- (d) Bipartite graph and its applications

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