

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

**Term-End Examination**

**June, 2023**

**MCS-033 : ADVANCED DISCRETE  
MATHEMATICS**

*Time : 2 Hours*

*Maximum Marks : 50*

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

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

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1. (a) Show that  $4^n$  is the solution of the following recurrence relation : 4

$$a_n = 3a_{n-1} + 4a_{n-2}$$

- (b) Find the recurrence relation and initial condition for : 6

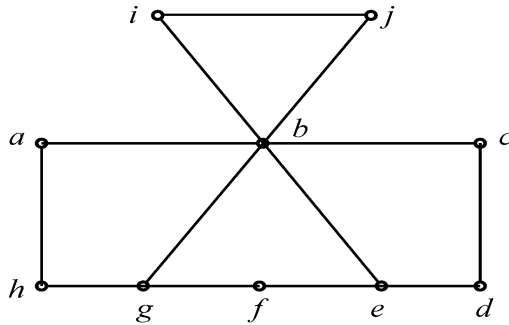
1, 5, 17, 53, 161, 485, .....

- (c) Find the generating function of the following sequence : 2

$$a_n = 1, n \geq 0$$

- (d) Show that in any graph the number of vertices with odd degree must be even. 4
- (e) Give examples of 2 regular, 3 regular and 4 regular graphs. 4
2. (a) If 10 persons each shake hands with each other, how many handshakes take place, what does this question have to do with graph theory? 5
- (b) Show that the graph  $k_{3 \times 3}$  is non-planar. 5

3. (a)



Show that the given graph has Hamiltonian circuit. 5

- (b) What is the chromatic number of the following graphs? 5
- (i) A complete graph
- (ii) A graph consists of isolated vertices

4. (a) Solve the following recurrence relation : 5

$$a_n - 7a_{n-1} + 10a_{n-2} = n \times 4^n$$

- (b) Determine the generating function of the following recurrence : 5

$$a_r = \begin{cases} 2^r, & \text{if } r \text{ is even;} \\ (-2)^r, & \text{if } r \text{ is odd} \end{cases}$$

5. (a) Solve the following : 5

$$a_{n+2} - 4a_{n+1} + 4a_n = 2^n$$

- (b) Solve the following recurrence using iteration method : 5

$$T(n) \begin{cases} = 1, & \text{if } n = 1 \\ = 2T(n-1), & \text{if } n > 1 \end{cases}$$