

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

**Term-End Examination**

**December, 2022**

**MCS-033 : ADVANCED DISCRETE  
MATHEMATICS**

*Time : 2 Hours*

*Maximum Marks : 50*

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

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

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1. (a) Find the next two terms  $(a_n)$   $n > 0$  beginning 3, 5, 11, 21, 43, 85 ..... Then give a recursive definition of the sequence.

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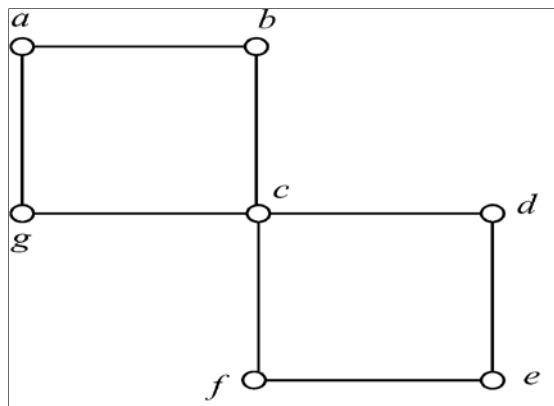
- (b) Show that :

$$a_n = 4.(2)^n + 7.(3)^n$$

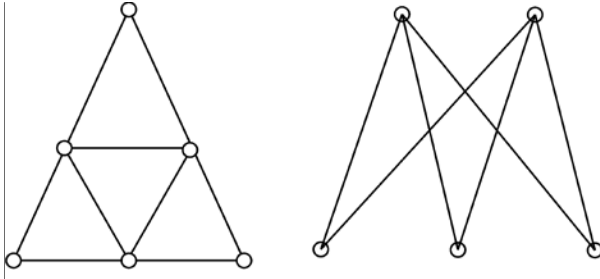
is the solution of recurrence relation

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

- (c) Find the generating function for 1, 2, 3, 4, 5, 6, ..... 2
- (d) How many vertices and edges must a graph have if its degree sequence is 4, 4, 3, 3, 3, 2, 1 ? 4
- (e) Draw the graphs of  $k_5, k_{3 \times 3}, k_{3 \times 4}$ . 4
2. (a) Decide whether the graphs  $G_1 = \{V_1, E_1\}$ ,  $G_2 = \{V_2, E_2\}$  are equal or isomorphic : 5
- $V_1 = \{a, b, c, d\}$
- $E_1 = \{\{a, b\}, \{a, c\}, \{a, d\}, \{c, d\}\}$
- $V_2 = \{a, b, c, d\}$
- $E_2 = \{\{a, b\}, \{a, c\}, \{b, c\}, \{c, d\}\}$
- (b) Show that the graph  $k_5$  is non-planar graph. 5
3. (a) Show that the given graph has Hamiltonian circuit : 5



- (b) What is the chromatic number of the graph given below? 5



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

$$a_n - 2a_{n-1} = 3 \times (2)^n$$

- (b) Use generating function to solve the recurrence relation : 5

$$a_n = 3a_{n-1} + 2; a_0 = 1$$

5. (a) Solve the following : 5

$$y_{n+2} - y_{n+1} - 2y_n = n^2$$

- (b) Use the method of inspection to solve the recurrence : 5

$$b_n = b_{n-1} + 4n^3 - 6n^2 + 4n - 1$$

for  $n \geq 1$  and  $b_0 = 1$ .