MCA (Revised)
Term-End Examination
June, 2021

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

Note : *Question no.* ***1*** *is* ***compulsory****. Attempt any* ***three*** *questions from the rest.*

1. (a) A software company offers an initial annual salary of ₹ 3,00,000 and an annual increment of 25% of previous year's salary. Find the recurrence relation for the salary at the beginning of the n^{th} year. *4*

(b) Let G (V, E) be an undirected graph having n vertices and e edges, then $\sum_{i=1}^{n} di = 2e$. *4*

(c) Find the generating function of the following sequences : *4*

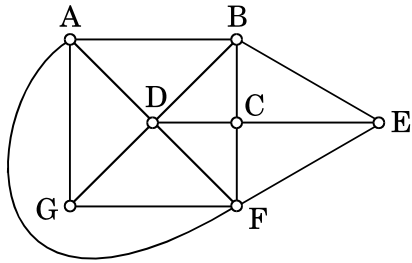
(i) $a_n = 2^n \quad n \geq 0$

(ii) $a_n = n \quad n \geq m$

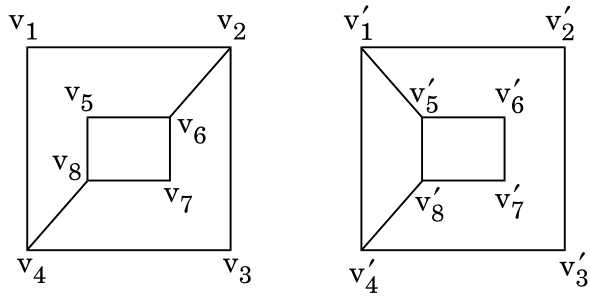
(d) Draw the following graph. Also find whether the graph is planar or not. *5*

k_5, $k_{3,3}$

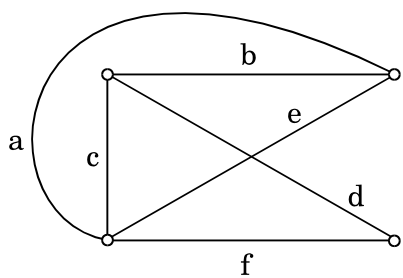
(e) Show that the graph is a Hamiltonian circuit. *3*



2. (a) Determine whether the following graphs are isomorphic. *5*

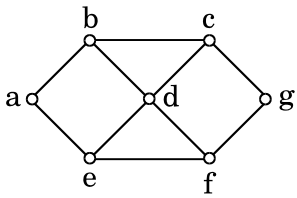


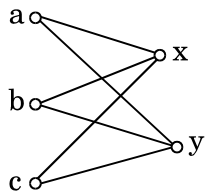
(b) Show that the following graph has no Euler circuit but has an Eulerian trail. *5*



3. (a) If G is a connected graph with $(n \geq 3)$ vertices and edges and no circuit of length 3, show that $e \leq 2n - 4$. *5*

(b) Find the chromatic number of each graph. *5*





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

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

(b) Let G be a graph with n vertices. Prove that the following statements are equivalent : *5*

(i) G has no cycles and $(n - 1)$ edges.

(ii) Any two vertices of G are connected by exactly one path.

5. (a) Find the generating function which will give the number of integral solutions $x + y + z = 5$ if $0 \leq x < 5$, $2 \leq y \leq 6$, $5 \leq z \leq 8$, x is even and y is odd. *5*

(b) Solve the following recurrence : *5*

$$a_{n+1}^2 = 5a_n^2 \text{ where } a_n > 0$$

$a_0 = 2$, and also find a_8.