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No. of Printed Pages : 5

MCS-033

MCA (Revised)

Term-End Examination, 2019

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) Find linear/non-linear, homogenous/non-homogenous, constant coefficients/not constants, degree of the following recurrence relations : [3]

(i) $a_n = (1.05)\, a_{n-1}$

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

(iii) $a_n = na_{n-1} + n^2 a_{n-2} + a_{n-1}, a_{n-2}$

(b) Solve the following recurrence relation : [5]

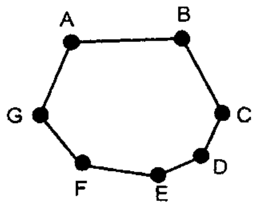
$$t_n - 3t_{n-1} - 4t_{n-2} = 0 \text{ for } n > 1$$

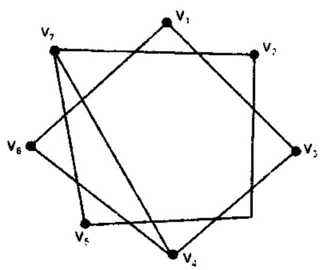
$t_0 = 0$

$t_1 = 1$

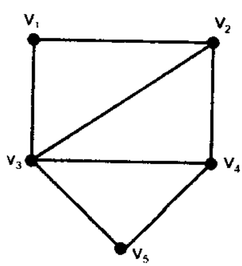
(c) Find the generating function for the following sequence 1, 1, 1, 1, 1, 1, 0, 0, 0. [3]

(d) Determine and explain whether the given pair of graphs is isomorphic or not : [3]

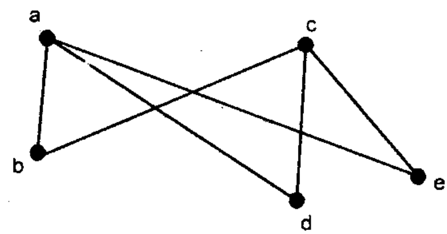




(e) For the following graph, determine whether Ore's theorem can be used to show that the graph has a Hamiltonian circuit : [3]



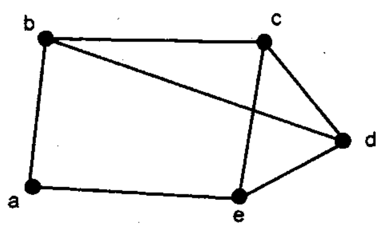
(f) What is plannar graph ? Explain whether the following Graph is plannar or not : [3]



2. (a) Solve the following recurrence relation : [5]

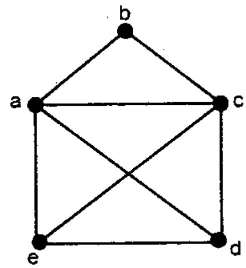
$$t_n - 5t_{n-1} + 7t_{n-2} - 3t_{n-3} = 0 \text{ for } n > 2$$
$$\text{with } t_0 = 1, t_1 = 2 \text{ and } t_2 = 3$$

(b) Determine whether the given graph has an Euler circuit : [3]



(c) What is chromatic number ? Find the chromatic number of the complete bipartite graph $k_{2,3}$. [2]

3. (a) Explain whether the following graph is a Hamiltonian graph or not : [2]



(b) Define r-regular graph. Construct a 4-regular graph with 12 vertices. [3]

(c) Find the generating function for the following sequence : [5]

0, 1, –2, 3, –4, 5, -6, ...

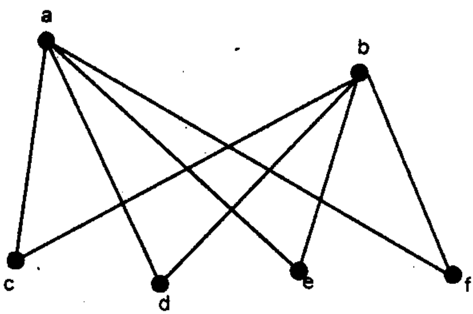
4. (a) Solve the recurrence relation $a_n = a_{n-1} + n \;\; a_0 = 3$ using the substitution method. [5]

(b) Find the chromatic number of the complete graph with five vertices (i.e. k_5). [2]

(c) What is edge coloring ? Color the edges of graph k_3 . [3]

5. (a) Give an example of a subgraph H of a graph G with $\delta(G) < \delta(H)$ and $\Delta H < \Delta(G)$. [3]

(b) Draw the complement of the following graph :[2]



(c) Solve the following recurrence relation : [5]

$$a_{n+2} = 3a_{n+1}, a_0 = 4$$

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