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MCS-033

MASTER IN COMPUTER APPLICATION (MCA)

Term-End Examination

December, 2020

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 Hours *Maximum Marks : 50*

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

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

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

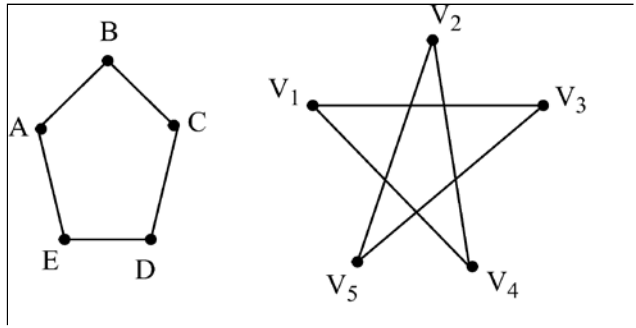
$$t_n - 5t_{n-1} + 6t_{n-2} = 0;$$

for $n > 1$ such that $t_0 = 0,\ t_1 = 1.$

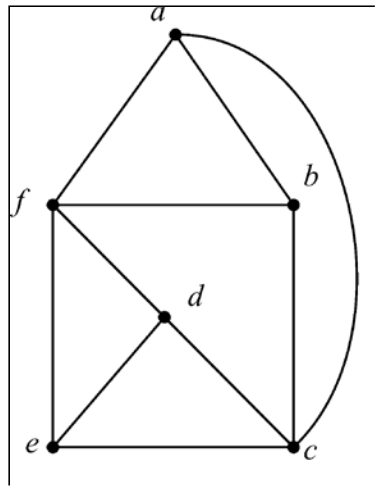
(b) Find the generating function for the following sequence : 3

1, 3, 3, 1, 0, 0, 0, 0

(c) Determine and explain whether the given pair of graphs is isomorphic. 3

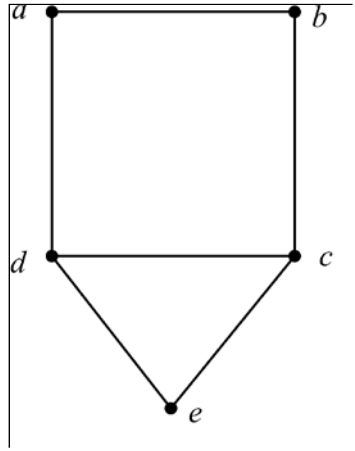


(d) Determine whether the given graph has a Euler circuit : 3

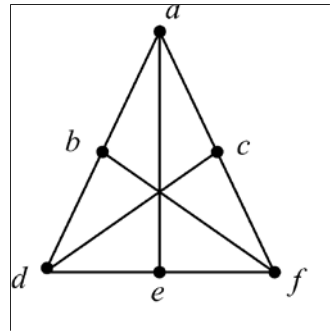


(e) For the following graph, determine whether Dirac's theorem can be used to

show that the graph has a Hamiltonian circuit or not ? 3



(f) Determine whether the given graph is planar. If so, draw it so that not two edges cross each other. 3

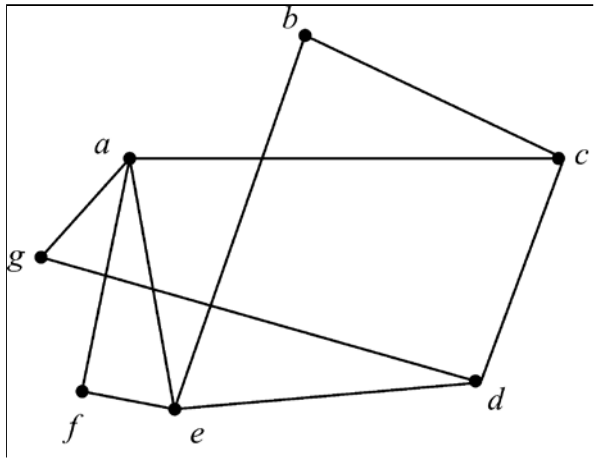


2. (a) Solve the following recurrence relation : 5

$$t_n - 7t_{n-1} + 15t_{n-2} - 9t_{n-3} = 0$$

for $n > 2$; with $t_0 = 0$, $t_1 = 1$ and $t_1 = 2$.

(b) Is the following graph bipartite ? Explain : 3



(c) Find the chromatic number of K_4. 2

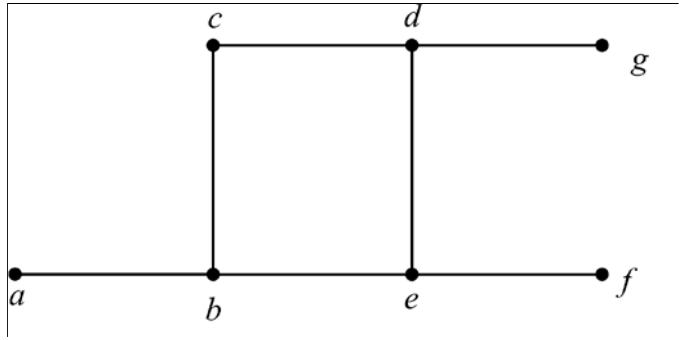
3. (a) Solve the following recurrence using substitution method : 5

$$t_n = 2t_{n-1} + 1;$$

for $n > 1$ with $t_1 = 1$.

(b) Prove that a connected graph G with two or more vertices is edge traceable if and only if it has exactly two vertices of odd degree. 5

4. (a) Determine whether the following graph has a Hamiltonian circuit or Hamiltonian path. 2



(b) Consider the following two degree sequence of any graph. Determine, for which sequence graph is possible, if not explain why ? 2

(i) (3, 2, 2, 2, 1)

(ii) (3, 2, 2, 2, 1, 1)

(c) Find the generating function for finite sequence : 3

2, 2, 2, 2, 2, 2

(d) Draw a 5-regular graph on 10 vertices. 3

5. (a) Show that if $G_1, G_2, ..., G_n$ are bipartite, then $\bigcup_{i=1}^{n} G$ is also bipartite. 5

(b) Find linear/non-linear, homogeneous/non-homogeneous, constant coefficients/non-coefficients and degree of the following recurrence relation : 3

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

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

(iii) $a_n = a_{n-1} + a_{n-2} + ... + a_0$

(c) By using Euler's formula, determine whether the following graph is planar or not ? 2