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MCS-033

MCA (Revised)

Term-End Examination

December, 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) Find the order and degree of the following recurrence relations. Determine whether they are homogeneous or non-homogeneous. *4*

(i) $a_n = a_0 a_{n-1} + a_1 a_{n-2} + ... + a_{n-1} a_0$

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

(b) Solve the following recurrence relation using the characteristic equation : *5*

$$a_n = 4a_{n-2}, \text{ where } a_0 = 4 \text{ and } a_1 = 6$$

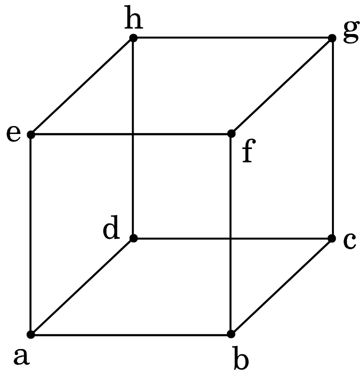
(c) Find the generating function for the following sequence :

$0^2, 1^2, 2^2, 3^2$ *3*

(d) Determine the number of subsets of a set of n elements, where $n \geq 0$. *4*

(e) Prove that the sum of the degree of vertices of any graph is twice the number of edges. *4*

2. (a) Define planar graph. State whether the following graph is planar or not. Justify your answer. *4*



(b) Solve the following recurrence relation using substitution method : *6*

$$a_n = a_{n/2} + 1, \text{ for } n = 2^k, k \geq 1, a_1 = 0$$

3. (a) Show that for a subgraph H of a graph G, $\Delta(H) \leq \Delta(G)$. *4*

(b) State the Tower of Hanoi problem. Write its recurrence relation and explain its formulation. *6*

4. (a) Explain the steps required to solve the linear homogeneous recurrence relation with constant coefficients through characteristic equation. *6*

(b) What are generating functions ? Why are they used ? *4*

5. (a) Draw a K_4 graph and show that it is four colourable. *5*

(b) Define an Eulerian circuit and an Euler path. State whether the following graph is an Eulerian circuit or an Euler path. Explain. *5*