No. of Printed Pages : 4 **MCS-033**

MCA (Revised)

Term-End Examination

December, 2018

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

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

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1. (a) Find the generating function of the following : *3*

$$2, 4, 8, 16, 32, \dots$$

(b) Prove that the number of vertices of odd degree in a graph is always even. *3*

(c) Find the order and degree of the following recurrence relation. Also state whether they are homogeneous or non-homogeneous. *6*

(i) $a_n = a_{n-1}^2 + a_{n-2}\, a_{n-3}\, a_{n-4}$

(ii) $d_n = n\, d_{n-1} + (-1)^n$

(d) Define :

(i) Walk

(ii) Path

(iii) Circuit

in an undirected graph. 3

(e) Solve the recurrence relation

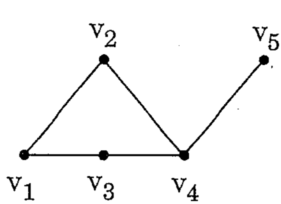
$a_r = a_{r-1} + 2a_{r-2}$ with $a_0 = 2$ and $a_1 = 10$. 3

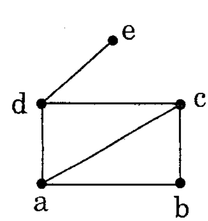
(f) Is every subgraph of a regular graph regular ? Justify. 2

2. (a) Find the solution of the recurrence relation

$$a_n = 3a_{n-1} + 2n$$ 5

(b) Determine whether the graphs are isomorphic 5





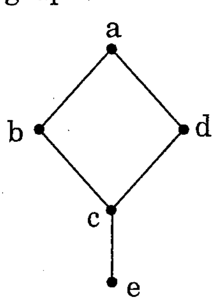
3. (a) Solve the recurrence relation

$$T_n = 2T_{n-1} + 1 \text{ if } n \geq 2 \text{ and } T_1 = 1$$

using generating function. *5*

(b) If an undirected graph has exactly two vertices of odd degree there must be a path joining these two vertices. *5*

4. (a) Find the chromatic number of the given graph. *2*



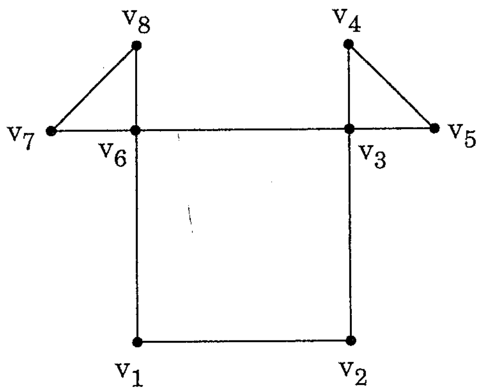
(b) Solve the recurrence relation by substitution method *4*

$$a_n = a_{n-1} + n \cdot 2^n;$$

$$a_0 = 1$$

(c) What is connected graph ? Explain with example. *4*

5. (a) Find Eulerian path in the given graph. *3*



(b) Solve : *3*

$$a_n - 2a_{n-1} = 7^n$$

(c) Given a connected planar graph with $p = 4$, $q = 6$, calculate the number of regions r. *4*
