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MCS-033

MCA (Revised)
Term-End Examination
December, 2015

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) Define regular graph. Find the number of edges of a 4-regular graph with 6 vertices. *3*

(b) Find the order of the following recurrences and state whether they are homogeneous or non-homogeneous : *4*

(i) $x_{n+1} + 2x_n - 15x_{n-1} = 0$

(ii) $3x_{n+1} - 7x_n + 4x_{n-1} = 3 + 2n$

(c) Solve the recurrence relation $x_{n+1} - 8x_n + 15x_{n-1} = 0$, where $x_0 = 5$ and $x_1 = 21$. *4*

(d) Find the generating function for the sequence 0, 1, – 2, 3, – 4. *3*

(e) Determine whether the sequence $\{a_n\}$ is a solution of the recurrence relation

$a_n = a_{n-1} + 2a_{n-2} + 2n - 9$, if $a_n = -n + 2$. 3

(f) Is a Hamiltonian graph Eulerian ? Is a Eulerian graph Hamiltonian ? Show with the help of a suitable example. 3

2. (a) Solve $a_{n+1} = 5a_n$ for $n \geq 0$, $a_0 = 2$ by Substitution method. 5

(b) Solve the recurrence

$a_n - 7a_{n-1} + 10a_{n-2} = 0, n \geq 2$

by Characteristic root method. 5

3. (a) Solve the recurrence by using iterative approach : 4

$$a_n = a_{n-1} + 2n + 3, \; a_0 = 4.$$

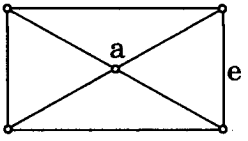
(b) Find the sequence $\{a_n\}$ having the generating function G given by

$$G(x) = \frac{3}{1-x} + \frac{1}{1-2x}.$$ 4

(c) Define isomorphic graph. Give an example of the same. 2

4. (a) State Euler's formula for the graph. 3

(b) For the following graph G,



draw subgraphs 3

(i) $G - e$

(ii) $G - a$

(c) Is a subgraph of a planar graph, planar ? Justify your answer. 4

5. (a) Solve $a_n = 4(a_{n-1} - a_{n-2})$ with initial condition $a_0 = 1$, $a_1 = 1$. 4

(b) For which value of m and n is $K_{m, n}$ a tree ? 3

(c) Show that C_6 is a bipartite graph. 3