MCA (Revised)

Term-End Examination

December, 2007

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

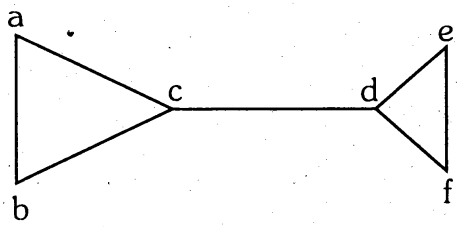
Note : *Question no. 1 is* ***compulsory****. Attempt any* ***three*** *questions from the rest.*

1. (a) Solve $a_{n+1}^2 = 10\ a_n^2$ where $a_n > 0$ and $a_0 = 5$. Also find a_6. *3*

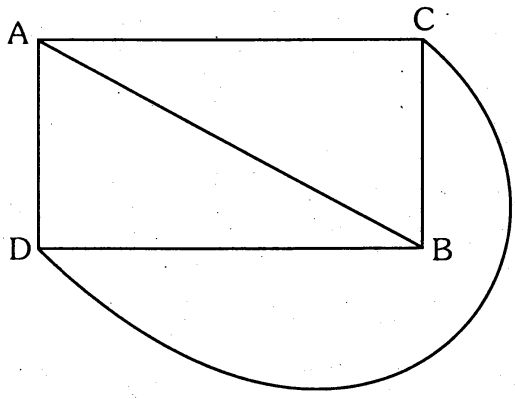
(b) Find the solution of $a_{n+1} = (n + 1)\ a_n$. Given $a_1 = 1$. Solve it for $n \geq 2$. *3*

(c) Solve $T_n = 3T_{n-1} + 2$ using generating function. Given $T_0 = 1$. Solve for $n \geq 2$. *5*

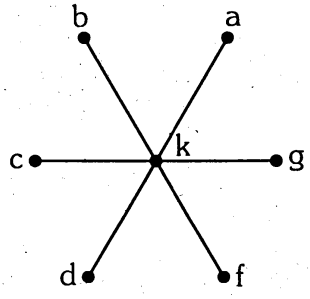
(d) Draw any four possible spanning trees of following graph : *3*



(e) Use Euler's formula to show that the following graph is planar. *3*



(f) Show that following graph is bipartite. 3



2. (a) Draw complete graphs with number of vertices as 2, 3, 4, 5. Also write the relation between number of vertices and number of edges. 3

(b) Describe Konigsberg's 7 bridges problem and Euler's solution to it. 5

(c) Draw a graph with 6 vertices which contains both Eulerian cycle and Hamiltonian cycle and both cycles are the same. 2

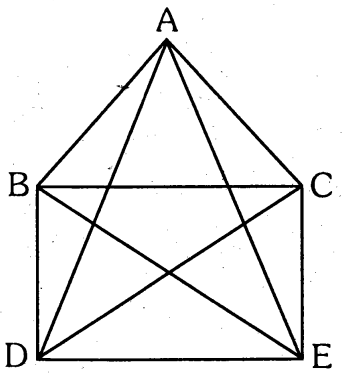
3. (a) What is the chromatic number of

(i) Bipartite graph ?

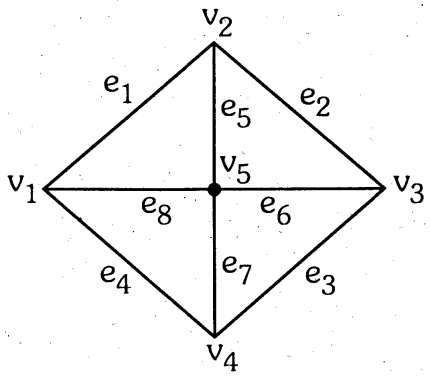
(ii) Complete graph with n vertices ?

Explain your answer w.r.t. vertex coloring. 3

(b) Find edge chromatic number for the graph : 3



(c) Find a cut set and fundamental cut sets in the following graph w.r.t. any spanning tree. *4*



4. (a) Solve the following recurrence relation :

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

Given $a_1 = 2$ and $a_2 = 3$. Solve it for $n \geq 3$. *6*

(b) Solve $a_n - a_{n-1} = n - 1$ for $n \geq 1$. Given $a_0 = 5$. *4*

5. (a) Identify the following relation as homogeneous, non-homogeneous and also find their order. *3*

(i) $a_r - 4a_{r-1} + 4a_{r-2} = (r + 1)\, 2^r$

(ii) $a_r - 5a_{r-1} + 6a_{r-2} + 7a_{r-3} = 0$

(iii) $a_r = \sin a_{n-1} + \cos a_{n-2}$

(b) Write a short note on Tower of Hanoi Problem. How can it be solved using recursion ? 4

(c) Solve $a_r - 7a_{r-1} + 10a_{r-2} = 0$, given $a_0 = 0$ and $a_1 = 3$. 3