

MCA (Revised)
Term-End Examination
December, 2007

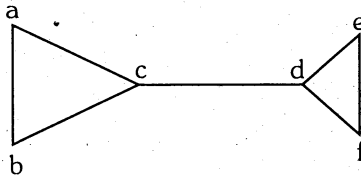
**MCS-033 : ADVANCED DISCRETE
 MATHEMATICS**

Time : 2 hours

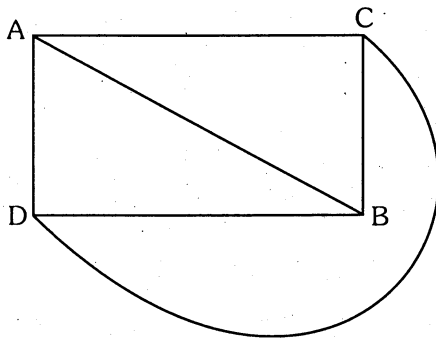
Maximum Marks : 50

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

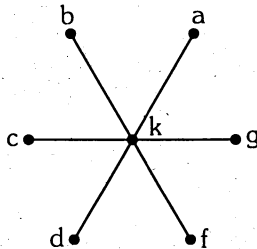
1. (a) Solve $a_{n+1}^2 = 10 a_n^2$ where $a_n > 0$ and $a_0 = 5$. Also find a_6 . 3
- (b) Find the solution of $a_{n+1} = (n + 1) a_n$. Given $a_1 = 1$. Solve it for $n \geq 2$. 3
- (c) Solve $T_n = 3T_{n-1} + 2$ using generating function. Given $T_0 = 1$. Solve for $n \geq 2$. 5
- (d) Draw any four 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 ?

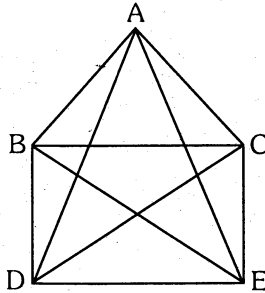
(ii) Complete graph with n vertices ?

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

3

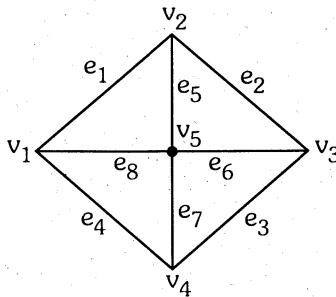
(b) Find edge chromatic number for the graph :

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