13632

MCA (Revised)

Term-End Examination

June, 2010

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

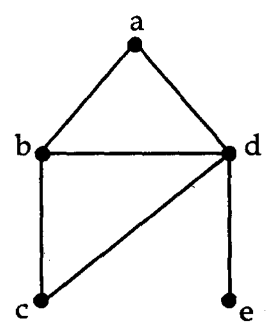
Note : *Question **no. 1** is **compulsory**. Attempt **any three** questions from the rest.*

1. (a) Find the order and degree, for each of the following recurrence, and determine for each whether it is homogeneous or not : 3

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

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

   (b) Find the complement of the given graph : 3



(c) Build a generating function for the geometric progression $\{ar^n : n \geq 0\}$, i.e, for $\{a, ar, ar^2 \ldots\}$. **4**

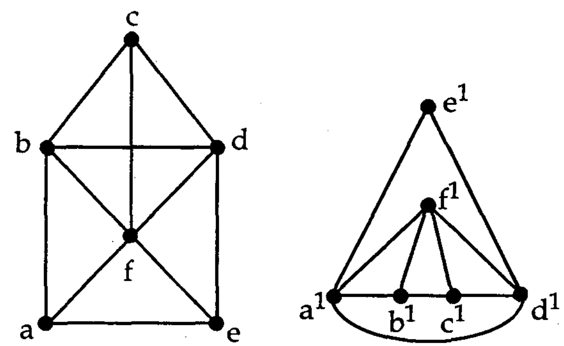
(d) Construct a 5 regular graph on 10 vertices. **3**

(e) Solve the recurrence relation : **3**

$$a_n - 5a_{n-1} + 6a_{n-2} = 0$$

where $a_0 = 2$, $a_1 = 5$

(f) Show that the graphs G and G^1 are isomorphic : **4**



2. (a) Define the concept of a spanning tree for a given graph G. Give a suitable example to illustrate the concept. **3**

(b) Define each of the following concepts supported with a suitable example : **4**

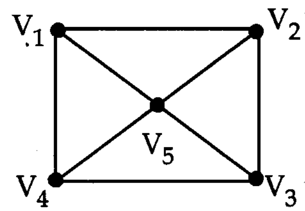
(i) Edge connectivity

(ii) Cut set

(iii) Bipartite Graph

(iv) Component Graph

(c) Find an Eular path in the graph : 3



3. (a) The n^{th} fibonacci number is defined as follows : 5

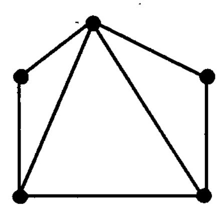
$$f_1=1,\ f_2=1, \text{ and } f_n=f_{n-1}+f_{n-2}$$

Using induction or otherwise, show that :

$$f_n = \left[\frac{1+\sqrt{5}}{2}\right]^n - \left[\frac{1-\sqrt{5}}{2}\right]^n$$

(b) Define the concepts of Eulerian and Harmiltonian graph supported with an example for each. 3

(c) Find the chromatic number of the following graph : 2



4. (a) Define the concept of a complete graph. Draw complete graph each for the case when number of vertices is given by : $n=3$, $n=4$. 3

(b) Show that the number of r - permutations of n objects, denoted by : 5

$$P(n, r) = n!/(n-r)!,$$

satisfies the recurrence relation :

$$P(n, r) = P(n-1, r) + rP(n-1, r-1)$$

(c) Show that for a subgraph H of a graph G, $\Delta(H) \leq \Delta(G)$, where $\Delta(P)$ denotes the maximum vertex degree for a graph P. 2

5. (a) For what values of n is K_n Eulerian. 3

(b) Using substitution method, solve the recurrence : 3

$$a_n = \frac{n-1}{n} a_{n-1} + \frac{1}{n}, n \geq 1 \text{ and } a_0 = 5$$

(c) Verify that the generating function for the binomial coefficients : 4

$\{C(k, 0), C(k, 1)a, C(k, 2)a^2, \ldots\}$ is $(1+az)^k$.