

**MCA (Revised)**  
**Term-End Examination**  
**June, 2017**

07192

**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 of the following recurrence relation. Also determine whether they are homogeneous or non-homogeneous. 6

(i)  $a_n = a_{n-1} + a_{n-2} + \dots + a_0$

(ii)  $a_n = na_{n-1} + (-1)^n$

(iii)  $a_n = a_{n-1} + a_{n-2}$

- (b) Solve the following recursion relation using characteristic equation : 6

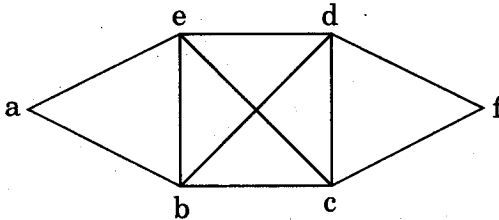
$$t_n = 4t_{n-1} - 3t_{n-2} \text{ for } n > 1$$

$$t_0 = 0$$

$$t_1 = 1$$

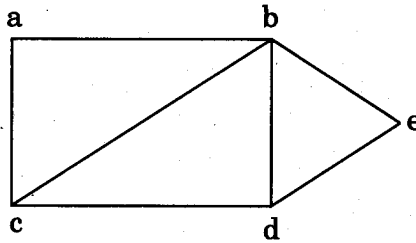
- (c) State and prove the handshaking theorem. 5
- (d) Define the following symbols : 3
- (i)  $\delta(G)$
- (ii)  $\langle S \rangle G$
- (iii)  $W_n$

2. (a) What is meant by complement of a graph ?  
Find the complement of the  $C_5$  graph  
(i.e.  $\bar{C}_5$ ). 3
- (b) What is a complete graph ? 2
- (c) Find the generating function for the  
sequence  
 $0^2, 1^2, 2^2, 3^2, \dots$  3
- (d) Determine the chromatic number of the  
following graph : 2



3. (a) Solve the recurrence relation  
 $a_n = a_{n-1} + 2, n \geq 2.$  6
- (b) Prove that the degree of every vertex in a  
connected Euler graph is even. 4

4. (a) Derive and explain the recursion relation drawn from the analysis of Merge Sort algorithm. 6
- (b) Determine whether the following graph has a Hamiltonian circuit and a Hamiltonian path. Explain your answer. 4



5. (a) Show and explain that if  $G_1, G_2, \dots, G_N$  are bipartite graphs, then  $\bigcup_{i=1}^n G_i$  is bipartite. 5
- (b) Show that  $K_4$  is a planar graph. 2
- (c) Define isomorphism. Determine whether the following pair of graphs are isomorphic : 3

