03587

MCA (Revised)

Term-End Examination

June, 2012

MCS-033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

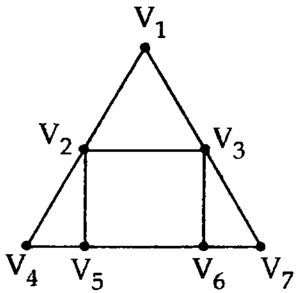
*Note : Question no. 1 is **compulsory**. Attempt **any three** questions from the rest.*

1. (a) Using mathematical induction method, show that $T_n = 2^n - 1$, $n \geq 1$, where T_n denotes the number of minimum number of moves required to transfer n discs from one peg to another under the rules of Tower of Hanoi/Brahma. **4**

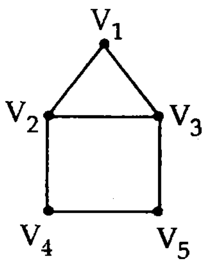
   (b) Find the generating function of the following function $a_r = \frac{1}{(r+1)\,!}$; $r = 0, 1, 2, ...$ What are combinatorial identities ? Explain with an appropriate example. **4**

   (c) Let G be a simple graph with 6 vertices and 11 edges. Check whether the graph G is connected or not. **4**

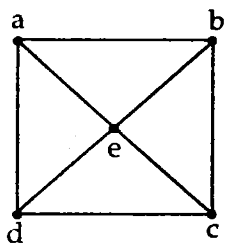
(d) Find the degree of each vertex in the given graph. **4**

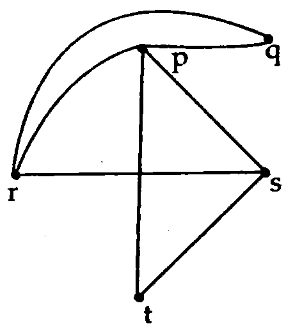


(e) What is the complement of the given graph. **4**



2. (a) Determine whether the graphs are isomorphic. **5**





(b) A connected planar graph has six vertices each of degree 4. Determine the number of regions into which this planar graph can be splitted ? 5

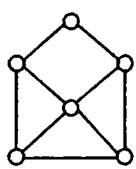
3. (a) Find the order and degree of the following recurrence relation. Also find whether they are homogeneous or non-homogeneous ? 4

(i) $a_n = \sin a_{n-1} + \cos a_{n-2} + \sin a_{n-3} + \ldots + e^x$

(ii) $a_{n=n} a_{n-2} + 2^n$.

(b) Prove that the generating function for the sequence of Binomial coefficients $\{c(k, 0), c(k, 1)\, a, c(k, 2)\, a^2, \ldots\}$ is $(1 + az)^k$. 6

4. (a) Determine the chromatic number of the following graph. 4



(b) Construct a non-Hamiltonian graph on 5-vertices. 3

(c) Check whether the complete graphs of 4 and 5 vertices are Eulerian. 3

5. (a) Show that, in a connected Eulerian graph, an Eulerian circuit can be traced starting from any vertex. 3

(b) Solve the recurrence relation given as follows : $a_n - 5a_{n-1} + 6\ a_{n-2} = 7^n$ 4

(c) Draw a graph which is both regular and bipartite ? 3
