M.Sc. 1st Semester Examination, 2013

COMPUTER SCIENCE

PAPER – COS-101

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

MODULE—1

(*Set Theory*)

[*Marks* : 25]

Answer **Q.No.1** and any **four** from the rest

1. Answer any *two* questions : 2×2

(*a*) What is the relation between permutation and combination and give its expression. 2

(*b*) How many bit strings of length five starting and ending with '1' bits ? 2

(*c*) Let $S = \{ a, b, c \}$. Find the power set of S. 2

2. Define and draw Venn-diagram of the following set operation : Union, Intersection and Complement. 4

3. Among 100 personal computer users surveyed, 27 use Dell, 35 use HP and 35 use HCL. Ten of them use both Dell and HP, eight use both Dell and HCL and twelve use both HP and HCL, Four use all three.

(*i*) How many use exactly one of these brands ?

(*ii*) How many only use other brands ? 4

4. State induction principle. Prove that

$$1 + 3 + 5 + \ldots + (2n - 1) = n^2$$

for any (+)ve integer n. 4

5. Let A, B, C are subsets of universal set S. Prove that

$$(A-C) \cap (B-C) = (A \cap B) - C.$$ 4

6. (*a*) How many ways could the three boys and four girls are to be sit along a bench if the boys must sit together and the girls as well ?

(*b*) How many different words of five letters can you make from the letters of word 'REPUBLICAN' if any word must contain two different vowels and three different consonants ? 2 + 2

7. Define partition of set. Let A be a subset of the universe S. Show that the set A and its complement partition S. 4

[*Internal Assessment* – 5 Marks]

MODULE–2

(*Graph Theory*)

[*Marks* : 25]

Answer **Q.No.1** and any **four** from the rest

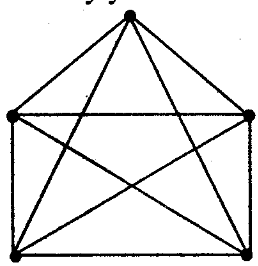
1. Answer any *two* questions : 2×2

(*a*) Define pseudograph and give an example. 2

(*b*) Define connected graph and component of a graph. 2

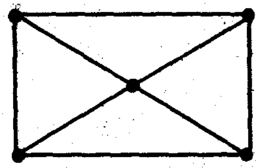
(*c*) Show that number of vertices of a binary tree is always odd. 2

2. Define Hamiltonian graph. Is the following graph is Hamiltonian ? Justify your answer. 4



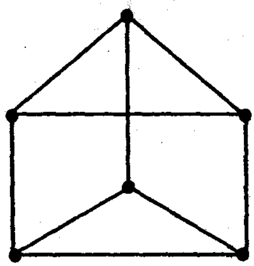
3. Show that any connected graph with n vertices and $(n-1)$ edges is a tree. 4

4. Define degree of a vertex of a graph. Find the degree of all vertices of the following graph and is it Eulerian graph ? 4



5. Define regular graph. Show that number of edges of a regular graph of degree r (where r is odd) must be multiple of r. 4

6. Find the ecentricities of all vertices of the following graph. Hence find its radius and diameter. 4



7. Define connected graph. Show that a simple graph G with n vertices is connected if G has at least $(n-1)(n-2)/2$ edges. 4

[*Internal Assessment* — 5 Marks]