2015

M.Sc.

1st Semester Examination

COMPUTER SCIENCE

PAPER—COS-101

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Mathematical Computation)

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

1. (i) What is Tautology ? Explain with an example.

   (ii) What do you mean by digraph of a relation ?

   (iii) Prove Pigeonhole Principle

   (iv) Define bipartite graph.   5×2

2. (i) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a * b = \dfrac{ab}{2}$.

(ii) Solve $a_n + 2 - 3a_{n+1} + 2a_n = 2^n$, $n \geq 0$ and $a_0 = 3$, $a_1 = 6$.

5+5

3. (i) Prove that $n! \geq 2^{n-1}$ for all $n \geq 1$.

(ii) Find the maximum number of edges in a simple connected graph with n vertices and k components.

5+5

4. (i) Define degree of vertex with example. Prove that the number of vertices of odd degree in a graph is always even.

(ii) Show that the following statement is true.

$$\rceil (P \wedge Q) \Leftrightarrow \rceil P \vee \rceil Q$$

5+5

5. (a) Rewrite the following argument using quantifiers, variables and predicate symbols. Prove the validity of the argument. If a number is odd, then its square is odd. K is a particular number that is odd.

$\therefore k^2$ is odd.

5

(b) Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n.

5

(Continued)

6. (a) Show that t is a valid conclusion from the premises
P = >q, q. = >γ, γ = s, ~s and P$\lor$t.

5

(b) Find the inverse of the permutation

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 5 & 4 \end{pmatrix}$$

3

(c) What is contrapositive, write down the truth table of it.

2

[Internal Assessment — 10 Marks]

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(Turn Over)