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) Prove by mathematical induction that $n \le 3^n$ for $n \in N$. 5

(ii) Prove by contradiction method— "There is no integer that in both even and odd". 5

(Turn Over)

2. (a) Let A, B, C are subsets of universal set S. Prove

$(A - C) \cap (B - C) = (A \cap B) - C$. 5

(b) State mathematical induction principle, Prove that, $1+3+5+...+ (2n^{-1})= n^2$. for any positive integer n.

5

3. (a) State the difference between string and a field. 5

(b) If G is a finite group, show that there exists a positive integer m such that $a^n=e$ for all $a \in G$. 5

4. (a) Show that the following statement is true.

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

(b) Show that t is a valied conclusion from the following premises.

$$P \Rightarrow Q, Q \Rightarrow \gamma, \gamma = S, \sim S \text{ and } P \vee t.$$

5. (a) Using Mathematical Induction to prove that of all integers $n \geq 4, 3^n \geq n^3$. 5

(b) In a group (G,*) by providing the inverse of every elements in unique, show that :

$(a * b)^{-1} = b^{-1} * a^{-1}$ for all $a, b \in G$. 5

6. (a) Verify the validity of the following arguments :

Every living thing is a plant or an animal. Legis dog is alive and it is not a plant. All animals have heart. Therefore Legis dog has a heart. 7

(b) Give on example of a group which is abelion but not cyclic. 3

7. (a) Use Mathematical induction to prove that $4^{n+1} + 5^{2n-1}$ is divisible by 21 for all $n > 0$. 5

(b) Solve :

$a_n+5a_{n-1}+6a_{n-2}=3n^2-3n+1$ with initial conditions $a_0=0,\ a_1=1$. 5

8. (a) Prove that the number of vestices of odd degree in a graph is always even. 3

(b) Show that $(p \vee q) \wedge (\sim p \wedge \sim q)$ is a contradiction.

3

(c) Let A=R−{ 3 } and B=R−{ 1 } where R is the set of real numbers. Let the function $f : A \rightarrow B$ be defined as

$$f\,xy = \frac{x-2}{x-3} \text{ for } x \in A.$$

Show whether f is bijective.
Also find f^{-1} if it exists.

[Internal Assessment — 10 Marks]
