(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : ME6

Roll No. | | | | | | | | | | |

M. TECH. (Sem.II)

THEORY EXAMINATION 2015-16

LOGIC FOR COMPUTER SCIENCE

Time : **3** Hours Total Marks : **100**

Note : Attempt all question. All question carry equal marks.

1. Attempt any four part of the following : 5×4=20

(a) Prove that for any binary relations R and S on a set A

(i) $(R^{-1})^{-1}=R$

(ii) $(R \cap S)^{-1}=R^{-1} \cap S^{-1}$

(iii) $(R-S)^{-1}=R^{-1}-S^{-1}$

(b) Prove that inverse of a bijective function is also a bijective function.

(c) Discuss the truth and falsehood for different operation.

(d) Prove that the set P_0 is countably infinite.

(e) Prove every finitely branching infinite tree has an infinite path.

(f) Discuss logical consequences and implications.

2. Attempt any two part of the following : 10×2=20

(a) Prove that logical equivalence is indeed a congruence relation on P0.

(b) Discuss the De Morgan's theorem with proof. Also show $\{\neg, \wedge, \vee\}$ is a functionally complete set.

(c) Using principles of induction prove that

(i) $C_0 \subset N_0 \subset P_0$

(ii) $D_0 \subset N_0 \subset P_0$

3. Attempt any two parts of the following : 10×2=20

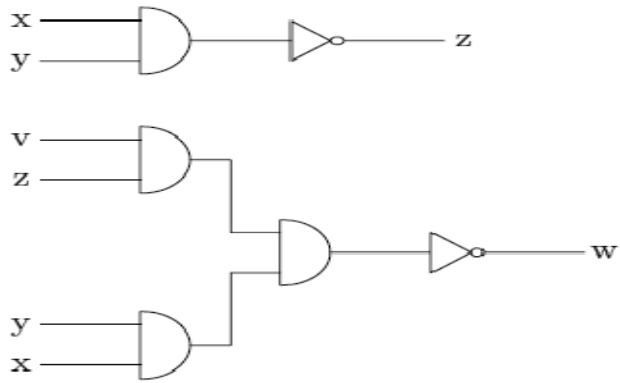
(a) Prove that for all $n \geq 3$, if n distinct points on a circle are joined by consecutive order by straight lines, then the interior angles of the resulting polygon add up to $180(n-2)$ degrees.

(b) Discuss the Universal Quantifier and Existence Quantifier with suitable example.

(c) What is the binding variable? Is expression $\exists x,y \forall z P(x,y,z,c)$ well-formed formulas?

4. Attempt any two parts of the following : 10×2=20

(a) Define the input-output behaviour of AND- gates and inverter-gates. Then describe the relation between input and output of the following nets :



(b) Find some suitable representation of sets. Then define some standard operations on sets like Union, Intersection, membership and set-difference in Prolog.

(c) Implement the merge-sort algorithm for integers in prolog- Informally it can be formulated as follows:
Given a list, remove its first element, sort the rest, and insert the first element in its appropriate place in the sorted list.

5. Attempt any two parts of the following : 10×2=20

(a) Write a Prolog program which determines if a collection of formula of propositional logic is satisfiable.

(b) Write an inference engine which exploits probabilities of rules so that it becomes possible to draw conclusion together with some measurement of their belief.

(c) Explain following:

(i) Logic inferences
(ii) Logical Database

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