VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

Term End Examination - May 2013

Course : ITE203 - Theory of Computation **Slot: D2+TD2**

Class NBR : 2912/2914

Time : Three Hours **Max.Marks:100**

PART – A (8 X 5 = 40 Marks)
Answer ALL Questions

1. Define the transition function for the following machines **[5]**
   i) PDA
   ii) Mealy Machine
   iii) NFA
2. Define the following: **[5]**
   i) Recursive Language
   ii) Greibach Normal form (GNF)
   iii) Right Linear Grammar
3. Design a Turing machine to compute the following function **[5]**

   $$f(x) = 3x$$

   Where *x* is a positive integer represented in unary.
4. Explain the basic model of Linear Bounded automata. **[5]**
5. Explain the different models of Turing Machine. **[5]**
6. Define the following with example: **[5]**
   i) Solvable and Unsolvable Problem
   ii) P Problem
   iii) NP Hard Problem
7. Define the Universal Turing machine. **[5]**
8. Write the properties of CFL. **[5]**

PART – B (6 X 10 = 60 Marks)
Answer any SIX Questions

9. a) Find the DFA for the following languages on ∑ = {a, b} **[5]**

   i) {w| w has at least three a's and at least two b'}

   ii) {w| w has an even number of a's and one or two b's}

   b) Construct the finite automata equivalent to the following regular expression. **[5]**

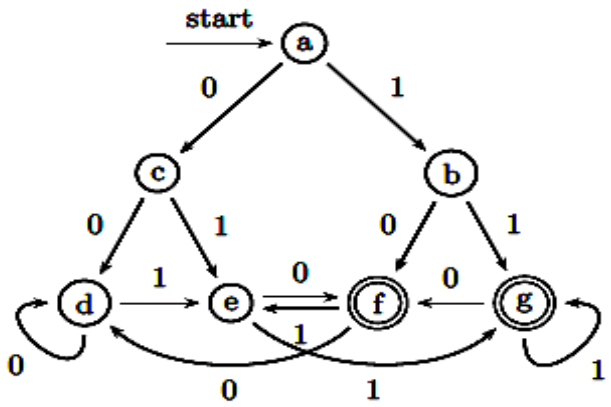
$$10(1+01)^* 0$$

10. a) Show that following language is not regular **[5]**

$$L = \{a^n b^m : n \geq m\}$$

   b) Design a Moore machine to determine the residue mod 3 for each binary number treated as a binary string. **[5]**

11. Minimize the following DFA **[10]**



12. a) Find the CFG for the following languages **[5]**

i) $L = \{a^n b^l : n \neq l\}$

ii) $L = \{a^n b^n c^k : k \geq 3, n \geq 0\}$

   b) Prove the following CFG is ambiguous. **[5]**

$$S \rightarrow bS \mid Sb \mid c$$

13. Convert the grammar **[10]**

$$S \rightarrow SAS \mid aB$$

$$A \rightarrow B \mid S$$

$$B \rightarrow b \mid \in$$

into Chomsky normal form.

14. Find an PDA that accepts the following language **[10]**

$$L = \{a^n b^n a^{m+2} : n \geq 0, m \geq 0\}$$

15. Design a Turing machine that will accept the following language **[10]**

$$L = \{0^{2^n} : n \geq 0\}$$

16. Construct Turing Machine (TM) that computes the following function **[10]**

$$f(x, y) = x - y \text{ if } x > y$$
and 0 otherwise
where x and y are in unary

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