Code No. 6117

FACULTY OF INFORMATICS

B.E. 3/4 (IT) I – Semester (Main) Examination, November 2013

Subject : Theory of Automata

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Design a DFA for strings containing even number of zeroes. (2)
2. Define $\in$ – closure of a state. (2)
3. What is halting problem? (2)
4. Write the regular expression denoting the strings that begin with a and end with a b over $\Sigma = \{a, b\}$. (2)
5. What is recursively enumerable language? (2)
6. Define parse tree and draw the parse tree for sting aabbab using the grammar. (3)

   $S \rightarrow aB \mid bA$

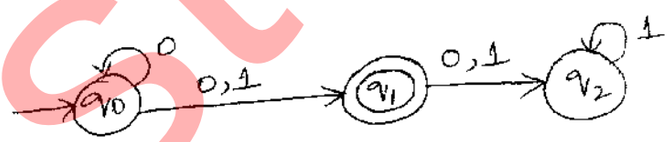
   $A \rightarrow aS \mid bAA \mid a$

   $B \rightarrow bS \mid aBB \mid b$

7. What do you mean by a) PDA by empty stack b) PDA by final state (3)
8. Give the context-free grammar that generates the set of palindrome strings. Also derive a sample string using this grammar. (3)
9. Define Homomorphism. Give an example. (3)
10. What is inherently ambiguous grammar? (3)

PART – B (5 x 10 = 50 Marks)

11.a) Convert the given NFA to DFA. (6)



b) Differentiate between NFA and DFA. (4)

12.a) State and prove pumping lemma for context free languages. (5)
b) Prove that the language $L = \{a^n b^n c^n \mid n \geq 1\}$ is not a context free language. (5)

13.a) Design a PDA for language $L = \{wcw^r \text{ where } w \in (a+b)^*\}$. (6)
b) Give the instantaneous descriptions for string aabcbaa. (4)

14. Design Turing machine for language $L = a^n b^n c^n$ where $n \geq 1$. Justify your design with a suitable example. (10)

15.a) Explain about undecidable problems. (5)
b) Explain about NP-complete problem. (5)

16. Convert the following grammar to Chomsky normal form. (10)

   $S \rightarrow OAo \mid 1B1 \mid BB$

   $A \rightarrow C$

   $B \rightarrow S \mid A$

   $C \rightarrow S \mid \in$

17. Write short notes on :
   a) Multi-stack machine (5)
   b) Applications of Finite Automata (5)

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