Theory of Computer Science - Dec 18

Computer Engineering (Semester 5)

**Total marks: 80  
Total time: 3 Hours**

INSTRUCTIONS  
(1) Question 1 is compulsory.  
(2) Attempt any **three** from the remaining questions.  
(3) Draw neat diagrams wherever necessary.

**1.a.**Explain Chomsky Hierarchy.

(5 marks)

**1.b.** Difference between PDA and NPDA.

(5 marks)

**1.c.** Define regular expression and give regular expression for

i) Set of all strings over {0,1} that end with 1 and has no substring 00

(5 marks)

**1.d.** Explain Halting Problem

(5 marks)

**2.a.** Define the finite state machine to determine the ternary number (base 3) is divisible 5.

(10 marks)

**2.b.** Give and explain formal definition of Pumping Lemma for Regular Language and prove that the following language is not regular

enter image description here

(10 marks)

**3.a.** Construct PDA accepting the language enter image description here

(10 marks)

**3.b.** Consider the following grammar

enter image description here

for the string 'ibtaeibta' find the following :

(i) Leftmost Derivation

(ii)Rightmost derivation

(iii)Parse tree

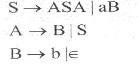
(iv)Check if above grammar is ambiguous.

(10 marks)

**4.a.** Construct TM to check wellformness of parenthesis.

(10 marks)

**4.b.** Convert following CFG and CNF



(10 marks)

**5.a.** Convert (0+1)(10)\*(0+1) into NFA with ϵϵ-moves and obtain DFA.

(10 marks)

**5.b.** Construct Moore and Mealy machine to convert each occurence of 100 by 101.

(10 marks)

**6** Write short note on any four -

(a)Closure properties of Context Free Language

(b)Applications of Regular expression and Finite automata.

(c)Rice's Theorem

(d)Moore and Mealy Machine.

(e)Universal Turing Machine

(20 marks)