[4658] – 164

Seat No.	

T. E. (Information Technology) (Semester – I) Examination, 2014
THEORY OF COMPUTATION
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Design a DFA that read strings made up of I = {0, 1} and accept only those strings which ends with 00 or 11. **8**

   b) Define and explain. **8**
   - i) Language
   - ii) Cartesian Product
   - iii) Regular Expression
   - iv) Kleen Closure.

   c) State and explain properties of FSM. **2**

   OR

2. a) Design a finite state machine for divisibility by 5 tester of a given decimal number. **8**

   b) Give RE for the following language over {0, 1}. **6**
   - i) Language of all strings that begin and end with 101.
   - ii) If L(r) = {00, 010, 0110, 01110, ... }. What is regular expression 'r'.

   c) Show that (a* b*) = (a + b)* **4**

3. a) Design a Mealy machine to accept binary strings having 101 or 110 as substring. **8**

   b) Construct DFA for regular expression (a + b)* abb. **8**

   OR

4. a) Convert following NFA into equivalent DFA **8**

   M = ($\{q_0, q_1,\}$, {0,1,}, δ, q_0, $\{q_1\}$) where

   $\delta(q_0, 0) = \{q_0, q_1,\}$

   $\delta(q_0, 1,) = \{q_1\}$

   $\delta(q_1, 1) = \{q_0, q_1\}$

   b) Construct NFA for following regular expressions. **8**
   - i) a * b (a + b)*
   - ii) (aa + bb)* bb (a + b)*

5. a) Show that following grammar is ambiguous $S \rightarrow aSbS \mid bSaS \mid \in$. **6**

   b) Convert following grammar to Chomsky Normal Form (CNF) **6**

   G = ({S}, {a, b}, P,S)

   P = $\{S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb\}$

   c) Obtain CFG to generate the language. **4**

   $I = \{a^{n+2} b^n \mid n > 0\}$

   OR

P.T.O.

6. a) Explain Chomsky hierarchy. **6**
   b) Consider the following grammar. **6**
   $S \rightarrow aAS \mid a$
   $A \rightarrow SbA \mid SS \mid ba$
   Derive the string aabbaa using
   i) Leftmost Derivation
   ii) Rightmost Derivation.
   c) Construct CFG for Binary strings containing substring 101 over input (0, 1) **4**

SECTION – II

7. a) Show that CFLs are closed under union, Concatenation and Kleene closure. **6**
   b) State and prove pumping lemma for context-free-language. **6**
   c) Convert the given grammar to equivalent left linear grammar. **6**
   $G = (\{A_0, A_1\}, \{a, b\}, P, A_0)$
   $P = \{ A_0 \rightarrow aA, A_1 \rightarrow bA1, A_1 \rightarrow bAo\}$

OR

8. a) Explain properties of regular expression. **6**
   b) Let G = ({A, B} , {a, b}, P,A) where P = {A $\rightarrow$ aB
   B $\rightarrow$ bB $\mid$a$\mid$ bA} **6**
   Construct a FA equivalent to G.
   c) Construct a regular grammar G generating the regular set represented by P = a*b (a+b)* **6**

9. a) Compare PDA with FSM and construct PDA for well formedness of Parenthesis $\Sigma = \{(,)\}$. **8**
   b) Define post machine and explain its elements. **4**
   c) Define acceptance by PDA. **4**
   i) By Final State
   ii) By Empty Stack.

OR

10. a) Show that post machine has more power than PDA and compare PDA with PM. **8**
    b) Obtain a PDA to accept the language $L = \{a^n b^n \mid n \geq 1\}$ by final state. **8**

11. a) Write a short note on universal turing machine. **8**
    b) Design a Turing machine to compute $2's$ complement of a given binary number. **8**

OR

12. a) Write a short notes on :
    i) Limitation of turing machine
    ii) Halting problem of turing machine. **8**
    b) Design a turing machine for concatenation of two strings over input {a, b} **8**

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