Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91350

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Computer Science and Engineering

CS 2303/CS 53/10144 CS 504/CS 1303 — THEORY OF COMPUTATION

(Common to Seventh Semester Information Technology)

(Regulation 2008/2010)

(Common to PTCS 2303 — Theory of Computation for B.E. (Part-Time) Fifth Semester – CSE — Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define Deductive proof.

2. Design DFA to accept strings over $\Sigma = (0,1)$ with two consecutive 0's.

3. Prove or disprove that $(r+s)^* = r^* + s^*$.

4. State the pumping lemma for regular languages.

5. Give the general forms of CNF.

6. Show that CFLs are closed under substitutions.

7. Let G be the grammar $S \rightarrow aB / bA \quad A \rightarrow a \,|aS|\, bAA \quad B \rightarrow b \,|bS|\, aBB$. For the string aaabbabbba, find (a) LMD and (b) RMD

8. Define Diagonalization (L_d) Language.

9. Define multitape turing machine.

10. Give examples for NP-complete problems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Prove that every tree has 'e' edges and 'e + 1' nodes. (6)

(ii) Prove that for every integer $n \geq 0$ the number $4^{2n+1} + 3^{n+2}$ is a multiple of 13. (10)

Or

(b) (i) Let L be a set accepted by a NFA and then prove that there exists a DFA that accepts L. (10)

(ii) Construct a DFA equivalent to the NFA. M=({a,b,c,d}, {0,1}, δ,a, {b,d}) where δ is a defined as (6)

δ	0	1
a	{b,d}	{b}
b	c	{b,c}
c	d	a
d	–	a

12. (a) Construct a minimized DFA for the RE 10 + (0 +11) 0*1. (16)

Or

(b) (i) Show that $L = \{0^{n^2} / \text{is an integer}, n \geq 1\}$ is not regular. (6)

(ii) Explain the DFA minimization algorithm with an example. (10)

13. (a) (i) Write a grammar G to recognize all prefix expressions involving all binary arithmetic operators. Construct a parse tree for the sentence '–* + abc/de' using G? (6)

(ii) Show that the following grammar G is ambiguous $S \rightarrow SbS / a$. (6)

(iii) Construct a context free grammar for $\{0^m 1^n / 1 \leq m \leq n\}$. (4)

Or

(b) (i) If L is context free language prove that there exists a PDA M, such that L = N(M). (8)

(ii) Prove that If L is $N(M_1)$ (the language accepted by empty stack) for some PDA M_1, then L is $N(M_2)$ (the language accepted by final state) for some PDA M_2. (8)

14. (a) (i) Find a grammar G' in CNF form equivalent to G,

$S \to a\,AD,\ A \to aB / bAB,\ B \to b,\ D \to d$. (6)

(ii) Convert to GNF the grammar G, G = ({A_1, A_2, A_3}, {ab}, P,A_1} where P consists of the following $A_1 \to A_2A_3$, $A_2 \to A_3A_1 / b$, $A_3 \to A_1A_2 / a$. (10)

Or

(b) (i) Design a TM, M to implement the function "MULTIPLICATION" using the subroutine "COPY". (12)

(ii) Show that language $\{0^n1^n2^n / n \geq 1\}$ is not context free language. (4)

15. (a) (i) Show that the union of two recursive language is recursive & union of two recursively enumerable language is recursive. (12)

(ii) Define the language L_u and show that L_u is RE language. (4)

Or

(b) State and Prove Post Correspondence Problem and Give example. (16)
