Sl. No.

B5.2-R4 : AUTOMATA THEORY AND COMPILER DESIGN

NOTE :
1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time : 3 Hours   **Total Marks : 100**

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1. (a) Obtain a DFA to accept strings of a's and b's having even number of a's and b's.

   (b) Explain the application of regular expression.

   (c) Consider the grammar

   $E \rightarrow T \,|\, T+E$

   $T \rightarrow int \,|\, int * E$

   Specify an input whose parsing is ambiguous and show two parse tree for it.

   (d) What is shift/reduce and reduce/reduce conflict ? Explain with example.

   (e) Draw a NFA for 010* + 0(01 + 10)*11.

   (f) Explain briefly the Halting problem.   .

   (g) Differentiate between L-attributed and S-attributed definitions with example.   **(7x4)**

2. (a) Describe the functions of each phases of compiler indicating the form of its input, output and type of errors to be detected. Show the result of each step of translation of the statement.

   $A = a + b*c*2$; type of a, b, c are float.

   (b) Write a LEX program to recognize the identifiers, numbers and keywords in a language.   **(10+8)**

3. (a) Define grammar. Explain Chomsky Hierarchy. Give an example.

   (b) Construct the predictive parser for the following grammar.

   Expr $\rightarrow$ -Expr | (Expr) | Var ExprTail

   ExprTail $\rightarrow$ -Expr | ϵ

   Var $\rightarrow$ id VarTail

   VarTail $\rightarrow$ (Expr) | ϵ **(8+10)**

4. (a) Give Push-Down automata that recognize the following language :

   $A = \{w \in \{0,1\}^* \,|\,$ w contains at least three 1s$\}$

   (b) Design a Turing machine to accept an even length Palindrome.
   (c) Differentiate parameter passing methods with example.   **(6+6+6)**

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5.   (a)   Explain various data structures used in symbol table management.

   (b)   Give transition tables for Push-Down Automata (PDA) recognizing the following language.

   L = The language of all non-palindromes over {a,b}   **(9+9)**

6.   Given the following CFG grammar G = ({S,A,B}, S, {a, b, x), P) with P :

   (1)   S → A

   (2)   S → xb

   (3)   A → aAb

   (4)   A → B

   (5)   B → x

   For this grammar answer the following questions :

   (i)   Compute the set of LR(1) items for this grammar and the corresponding DFA.

   (ii)   Construct the corresponding LR parsing table.

   (iii)   Show the stack contents, the input and the rules used during parsing for the input string w = axb$.   **(8+6+4)**

7.   (a)   Write short note on :

         (i)   Different intermediate representation

         (ii)   Peephole Optimization

   (b)   Discuss the issues in the design of code generation.   **([6x2]+6)**

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