

Code No: 156EM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August/September - 2024

AUTOMATA THEORY AND COMPILER DESIGN

(Computer Science and Design)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.  
 ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
 iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A****(25 Marks)**

- 1.a) Design Finite Automate for the language containing only 'a' over an  $\Sigma$  (a, b). [2]
- b) Compare NFA and DFA. [3]
- c) Define ambiguous grammar with an example. [2]
- d) Give the identity rules of Regular Expressions. [3]
- e) Specify the properties of undecidable problem. [2]
- f) Illustrate equivalence between PDA and CFG. [3]
- g) Define LR grammar. [2]
- h) Describe the structure of Lex program. [3]
- i) Compare synthesized attributes and inherited attributes. [2]
- j) Write about design issues of code generator. [3]

**PART – B****(50 Marks)**

- 2.a) Design a DFA which accepts all strings which are not ending with 101 over an alphabet {1, 1}. [5+5]
- b) Test whether the following two FSM's are equivalent or not. [5+5]

$M_1$	A	B
$\rightarrow q_0$	$q_1$	$q_3$
$q_1$	$q_0$	$q_2$
$q_2$	$q_3$	$q_1$
$q_3$	$q_2$	$q_0$

 $q_1$  and  $q_3$  are final states

$M_2$	a	B
$\rightarrow q_0$	$q_2$	$q_2$
$q_1$	$q_2$	$q_0$
$q_2$	$q_0$	$q_1$

 $q_2$  : Final State**OR**

- 3.a) Let L be a set accepted by a NFA. Then show that there exists a DFA that accepts L?
- b) Design NFA to accept set of all strings starting  $ab$  and ending with  $ba$  over an alphabet is (a, b). [5+5]

- 4.a) Convert the following regular expression into an equivalent DFA.  
 RE=  $0^*(10^*) + 1^*(0^*1)$ .
- b) Demonstrate the closure properties of context free languages with suitable examples. [5+5]

**OR**

- 5.a) Construct a context-free grammar for the language  $L = \{a^m b^n c^n d^m \mid m, n \geq 1\}$ . Provide a detailed derivation of the string "aabbccdd" using this grammar.
- b) Prove using the pumping lemma that the language  $L = \{0^n 1^m \mid n \neq m\}$  is not regular. [5+5]

- 6.a) Design a TM for the language  $L = \{a^n b^m a^n \mid m, n \geq 1\}$ .
- b) Design a PDA for the language  $L = \{1^n 0^n \mid n \geq 1\}$ . [5+5]

**OR**

- 7.a) Explain in detail about Chomsky Hierarchy of Languages with a neat diagram.
- b) Illustrate post correspondence problem with an example. [5+5]

- 8.a) Discuss in detail about one – buffer and two - buffer scheme with an example
- b) List and discuss in detail about phases of compiler with a neat diagram. [5+5]

**OR**

9. Consider the grammar:

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow ( E ) \mid id$$

Construct LALR parsing table for given grammar? Give step by step LALR parsing for the input string  $id + id * id$ . [10]

- 10.a) Discuss in detail the syntax directed translation of *do-while* statement.
- b) List and discuss various forms of intermediate representation with suitable examples. [5+5]

**OR**

- 11.a) Explain in detail about peephole optimization techniques.
- b) Distinguish between static, stack, and heap storage allocation strategies. [5+5]

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