No. of Printed Pages : **2**

Sl. No.

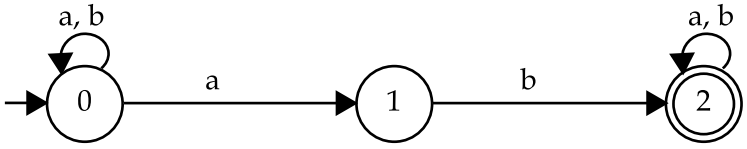
B5.2-R4 : AUTOMATA THEORY AND COMPILER DESIGN

NOTE :

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

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

1. (a) Convert the following NFA into DFA :



(b) Write a regular expression for the set of all strings containing at least two 0's over the alphabet {0,1}.

(c) What is the use of a symbol table ? How symbol table can be implemented.

(d) Explain Chomsky Hierarchy with suitable example.

(e) How CPU registers are allocated while creating machine code ?

(f) What is an activation record ? Explain how they are used to access various local and global variables.

(g) Draw an NFA that accepts the language denoted by the following regular expression and convert it into DFA :

(ab+cd)* c **(7x4)**

2. (a) Design a mealy machine to determine the residue mod 3 of a binary number.

(b) Explain the various phases of a compiler in detail. Assuming an expression give the output of each phase.

(c) Let w be any string of length n is {0,1}*. Let L be the set of all substrings of w. What is the minimum number of states in a non-deterministic finite automaton that accepts L ? Justify your answer. **(6+6+6)**

3. (a) What is syntax directed translation scheme ? Also explain the implementation of syntax directed translation ?

(b) Design a Turing Machine that accepts all palindromes over $\sum$= {a, b}.

(c) Check whether the given grammar is ambiguous or not-

$$S \rightarrow AB \ / \ C$$
$$A \rightarrow aAb \ / \ ab$$
$$B \rightarrow cBd \ / \ cd$$
$$C \rightarrow aCd \ / \ aDd$$
$$D \rightarrow bDc \ / \ bc$$

(6+6+6)

4. (a) Construct a PDA for language L = {wcw^R | w={0, 1}*} where w^R is the reverse of w.

(b) Explain the Difference between parse trees and Syntax tress with suitable example.

(c) What is code optimization ? Explain about various levels and types of optimizations. **(6+6+6)**

5. (a) Design minimum state deterministic finite automation accepting the language L = {w ϵ {0,1}* | w has number of 0's divisible by 2 and number of 1's divisible by 5 respectively}

(b) Write Three Address Code for the following expression-

If A < B and C < D then t = 1 else t = 0

(c) Consider the following grammar-

$$S \rightarrow T\ L$$
$$T \rightarrow int \mid float$$
$$L \rightarrow L\ ,\ id \mid id$$

Parse the input string int id , id ; using a shift-reduce parser. **(6+6+6)**

6. (a) Construct a PDA for language L = $\{0^n1^m2^m3^n \mid n>=1, m>=1\}$

(b) Check whether language of the following grammar is finite or not :

$$S \rightarrow XS \ / \ b$$
$$X \rightarrow YZ$$
$$Y \rightarrow ab$$
$$Z \rightarrow XY$$

(c) Construct a DAG for the following three address code :

1. a = b + c
2. t1 = a x a
3. b = t1 + a
4. c = t1 x b
5. t2 = c + b
6. a = t2 + t2

(6+6+6)

7. (a) Write Short Notes on the following :

(i) Nested Lexical Scoping

(ii) Global Optimization

(b) Draw a DFA for the language accepting strings ending with 'abb' over input alphabets ∑ = {a, b}.

(c) What is intermediate code ? Write the two benefits of intermediate code generation. **(6+6+6)**

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