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**

1.

a) How does semantic analysis differ from syntax analysis?

b) How can you speed up the lexical analyzer using input buffering?

c) Predictive parsers are mostly used for parsing a sentence - Justify.

d) How can you find a Regular Expression determined by a transition system using Arden's theorem. Write down the assumptions you have made.

e) What do you mean by ℓ-values and r-values of an identifier? How are they used in translation of expressions?

f) Suppose G is the grammar with the following production rules.

list→list+list
list→list-list
list→digit
digit→0|1|2|…..|9

Show that G is ambiguous and convert it into unambiguous one.

g) What are the different ways of representing three address statements? Explain.

(7×4)

2.

a) Prove that 1+3+5+……..+r = n^2 ,for all n>0, where r is an odd integer and n is the number of terms in the sum (Note: r = 2n-1).

b) Define Kleene clousure.Explain with an example.

c) Construct a Moore machine which is equivalent to the Mealy machine given by the state transition table

	Next state			
Present state	input a=0		input a=1	
	state	output	state	output
$\rightarrow q_1$	q_3	0	q_2	0
q_2	q_1	1	q_4	1
q_3	q_2	1	q_1	0
$\textcircled{q_4}$	q_4	1	q_3	0

(5+6+7)

3.

a) Construct a FA equivalent to regular expression (0+1)*(00+11)(0+1)* .Construct the transition graph and transition table of the corresponding NDFA. Convert the NDFA to DFA with reduced number of states.

b) Design a Turing machine to recognize all strings consisting of an even number of 1's.

(9+9)

4.

a) Find a reduced grammar given equivalent to the grammar G whose productions are S→AB|CA, B→AB|BC, A→a, C→aB|c.

b) Construct a PDA accepting the set of all strings over {a,b} with equal no. of a's & b's.

c) Define Type 2 and Type 3 grammar. Find the highest type number which can be applied for the following grammars.

i. S→Aa, A→c|Ba B→abc
ii. S→ASB|d A→aA

(7+7+4)

5.

a) How does a table driven predictive parser work?
b) Describe the use of Stack & Heap in runtime allocation.
c) To improve the target code we generally use copy propagation, code motion and reduction in strength. Explain and give example in each case.

(6+6+6)

6.

a) Define LR parser. What are its merits? Also point out the drawbacks of LR parsing method.
b) Suppose you want to parse the string id +id*id. Show the operator precedence relations of id, + and *.Give the procedure for finding handle using the above precedence relation.

(8+10)

7.

a) What is a syntax directed definition? Define synthesized attribute. Write a syntax directed definition for expression in infix to postfix translation. The expression will have the symbols numbers (0-9),+ and -, e.g., 4+5-6.
b) How can you define a Direct Acyclic Graph (DAG).Write down its applications?
c) Draw the DAG for the following code.

1. t_1 := 4*i
2. t_2 := a[t_1]
3. t_3:= 4*i
4. t_4:= b[t_3]
5. t_5:= t_2*t_4
6. t_6:= prod+t_5
7. prod:= t_6
8. t_7:= i+1
9. i:= t_7
10. if i <= 20 goto(1)

(9+5+4)