

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) Explain Kleen's closure of context free language.
 - b) Differentiate between Grammar 0 and grammar 1 type using an example.
 - c) How algebraic expressions and Unambiguous CFG are inter-related.
 - d) Differentiate between Turing machine and push down automata machine.
 - e) Explain the significance of phases of compiler in detail.
 - f) Discuss the role of lexical analyzer in compiler design.
 - g) Discuss the role of Parser in compiler design.

(7x4)

2. Design a DFA (Deterministic Finite Automaton) to accept the language $L1 = \{\alpha \in \{a, b, c\}^* \mid \alpha \text{ starts and ends with the same symbol}\}$. Only draw the transition diagram, and clearly indicate the start state and the final state(s).

(18)

3.
 - a) What role does semantic analysis play in compiler design? Give example of a semantic error that cannot be detected at compile stage.
 - b) Write a LEX program that reads an input file and counts the number of times a newline character appears in the file and outputs the final count.
 - c) Remove left recursion from the grammar:
E \rightarrow E + T | T
T \rightarrow T * F | F
F \rightarrow id

(6+6+6)

4. Write an unrestricted grammar to accept the language $L4 = \{a^i b^j c^k d^l \mid i = k \text{ and } j = l\}$. Mention the start symbol of your grammar. Use upper-case Roman letters for non-terminal symbols.

(18)

5.
 - a) Discuss the principal sources of code optimization. Discuss the rules for code improving transformation in detail.
 - b) What is Peep Hole Optimization? Discuss the procedure to generate code from DAGs.

(9+9)

6.
 - a) For the regular expression given below, obtain an NFA without E- moves.
(0+1)*(00+11)
 - b) Design a Moore machine that accepts all strings of 0's and 1's treated as binary integer return a remainder 1 when divided by 3.
 - c) Give the statement of pumping lemma and using it prove that the following language is not regular.
 $L = \{0^{L^2} \mid L \text{ is integer, } i \geq 1\}$

(6+6+6)

7. Write short notes on **any three**:
- a) Dynamic storage allocation techniques
 - b) Syntax directed definitions
 - c) Compiler construction tools
 - d) Bacus Naur form

(3x6)