

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) What are the differences between an interpreter and a compiler? What are the uses of loader?
- b) Define: Deterministic Finite Automata. How is it different from Non-deterministic Finite Automata?
- c) How can one say that Turing Machine is more powerful compared to FA and PDA?
- d) List the phases that constitute the front end of a compiler. Mention the back-end phases of a compiler.
- e) What is ambiguous grammar? Check given grammar is ambiguous or not.
- f) Construct operator precedence table for given grammar.
- g) List the various error recovery strategies for a lexical analysis. What does a semantic analysis do?

(7x4)

2.

- a) Prove using mathematical induction that
$$1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1)/6$$
, for all positive integers n.
- b) Consider the two regular expressions:
 $R1 = a^* + b^*$ $R2 = ab^* + ba^* + b^*a + (a^*b)^*$
 1. Find a string corresponding to R1 but not to R2.
 2. Find a string corresponding to neither R1 nor R2.
- c) Construct NFA for $(a^* | b) c a^*$ using Thomson's construction method.

(6+6+6)

3.

- a) Find first and follow set for given grammar.
 $S \rightarrow (L) | a$ $L \rightarrow L, S | S$
- b) Explain the processing of various phases of 'C' Compiler on the following statement.
position = initial + rate * 60
- c) Define Phase and Pass with respect to compiler. Also list the reasons for separating lexical analyzer from syntax analyzer.

(6+6+6)

4.

- a) Explain the 'Dangling Else' phenomenon with a suitable example grammar. Also write equivalent unambiguous grammar.
- b) Check whether below grammar is LL (1) or not.
 $S \rightarrow ABCDE$
 $A \rightarrow a | \epsilon$
 $B \rightarrow b | \epsilon$
 $C \rightarrow c$
 $D \rightarrow d | \epsilon$
 $E \rightarrow e | \epsilon$

(10+8)

5.

a) Generate CLR parsing table for given grammar.

$S \rightarrow AaAb \mid BbBa$

$A \rightarrow \epsilon$

$B \rightarrow \epsilon$

b) Convert the following CFG into CNF

$S \rightarrow ASA \mid aB,$

$A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$

(10+8)

6.

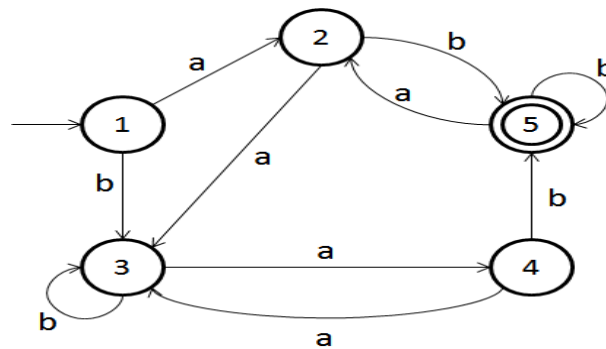
a) Generate LR(0) item set for given grammar.

$S \rightarrow Aa \mid bAc \mid Bc \mid bBa$

$A \rightarrow d$

$B \rightarrow d$

b) Check given DFA is minimized or not. If not then convert it in minimized one.



c) Construct PDA for accepting the language: $L = \{ XcY \mid X \text{ and } Y \text{ are belongs to } \{a, b\}^+ \text{ and } |X|=|Y|$

(6+6+6)

7. Write short note on the following:

a) DAG

b) S-attributed definition and L-attributed definition.

c) Dynamic storage allocation techniques.

(6+6+6)