METCE 1st YEAR 2nd SEMESTER EXAMINATION

Compiler Construction

Session 2023-24

Answer all questions in order. Time : Three hours Full Marks 100

Part A

Fill in the blanks: Answer any ten questions. **Marks 10x2=20**

1. Name the four components of a context free grammar.
2. Define a regular expression.
3. What is relop?
4. State the difference between actual parameter and formal parameter.
5. Draw the parse tree for the string S → SS + | SS* | a.
6. What does the Lex do?
7. Translation rules each have the form Pattern {Action}. Define pattern and action.
8. State the function of the Lookahead Operator.
9. Give an example to show why it is important to have set precedence of operators.
10. Name the 4 error recovery strategies in Syntax Analysis.
11. How are regular expressions different from context-free grammars?
12. Give the intermediate code for :do i=i+1; while (a[i] < v) .
13. State one problem with "left-recursive" productions.

Part B

Answer any 8 of the following questions in order: **Marks 10x8=80**

1. a) What is a recursive descent parser?
   b) Construct a recursive descent parsers for the Give a rightmost derivation for the string
   (i) S →+ SS | -SS | a
   (ii) S → S (S) S | ε

2. Design an algorithm to recognize Lex-lookahead patterns o the form r1/r2 where r1 and r2 are regular expressions. Show how your algorithm works on the following inputs:
   a) (abcd|abc)/d
   b) (a|ab)/ba
   c) aa*/a*

3. Write a Lex program that copies
   a) a file, replacing each non-empty sequence of white space by a single blank.
   b) a C program, replacing each instance of the keyword float by double.

4. Describe the languages denoted by the following regular expressions:
   a) a(a|b)*a
   b) ((ε|s)b*)*
   c) (a|b)*a(a|b)(a|b)
   d) a*ba*ba*ba*

   Draw transition diagrams to recognize the above languages.

5. Illustrate with examples the difference between intermediate language and implementation language. Hence explain what a cross compiler is.

6. Construct the NFA, DFA, and the transition table for the regular expression a(a|b)*ab .

7. Consider the grammar:
   A → B C x | y
   B → y A | ε
   C → A y | x
   where {A,B,C} are nonterminal symbols. A is the start symbol, {x,y} is the set of terminal symbols. Show the FIRST and FOLLOW sets for each nonterminal symbol to show whether this is a LL(1) grammar or not.

8. Design finite automata for each of the following language:
   a) All strings of lowercase letters that contain the five vowels in order.
   b) All strings of digits with at most one repeated digit.

9. What kinds of source program errors would be detected during lexical analysis and during syntactic analysis?

10. Illustrate the methods explaining the recursive invocation of the procedure using static and automatic storage allocation scheme.