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Reg No.: \_\_\_\_\_

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S6 (PT) (S,FE) Examination May 2024 (2015 Scheme)



Course Code: CS304

Course Name: COMPILER DESIGN

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

Marks

- 1 Discuss the role of a lexical analyzer. (3)
- 2 Define the terms: lexeme and token. How many tokens are there in the following C statement?  
`printf("Total = %d\n", score);` (3)
- 3 Describe the recursive procedure of a recursive descent parser. (3)
- 4 Write an algorithm to eliminate left recursion from a grammar. (3)

**PART B**

*Answer any two full questions, each carries 9 marks.*

- 5 a) Describe the techniques used for input buffering. (6)  
b) What is bootstrapping? Apply bootstrapping to develop a compiler for a new high level language P on machine N. (3)
- 6 a) Define parse tree. Construct a parse tree for the expression – (id + id). (5)  
b) Design a transition diagram for unsigned numbers. (2)  
c) Write a regular expression for the set of strings containing 001 or 11 as substring. (2)
- 7 a) Consider the context free grammar: (5)  
 $S \rightarrow S S + / S S * / a$   
And the string: aa + a \*
  - i) Give a leftmost derivation for the string
  - ii) Give a rightmost derivation for the string
  - iii) Give a parse tree for the string
  - iv) Is the grammar ambiguous or not? Justify.  
b) Explain the error recovery strategies adopted by a parser. (4)

**PART C**

*Answer all questions, each carries 3 marks.*

- 8 Explain handle pruning. (3)

- 9 Discuss the conflicts in a shift-reduce parser. (3)
- 10 Explain L attributed definitions. (3)
- 11 What are annotated parse tree? Give examples. (3)

**PART D**

*Answer any two full questions, each carries 9 marks.*

- 12 The following grammar generates regular expressions over {a, b}: (9)

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T F \mid F$$

$$F \rightarrow F^* \mid a \mid b$$

Prove that the grammar is SLR.

- 13 a) Explain the working of a shift reduce parser. (5)
- b) Write Syntax Directed Definition of Desk calculator (4)
- 14 a) Design a type checker for simple arithmetic operations. (5)
- b) Distinguish between synthesized and inherited attributes. (4)

**PART E**

*Answer any four full questions, each carries 10 marks.*

- 15 a) What is a DAG? Draw a DAG for the expression:  $a + a * (b - c) + (b - c) * d$  (5)
- b) Distinguish between static and dynamic storage allocation. (5)
- 16 Explain the different forms of three address code instructions. (10)
- 17 a) What are triples? Write the triple representation of the expression:  $a = b^* - c + b^* - c$  (6)
- b) How do we construct a flow graph from the three address code representation of a source program? (4)
- 18 a) Explain optimization of induction variables in loops. (6)
- b) Discuss the need of register descriptors and operand descriptors in code generation. (4)
- 19 Explain the code generation algorithm. (10)
- 20 a) Explain common sub expression elimination with an example. (6)
- b) Explain code motion with an example. (4)

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