Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech examinations (S), September 2020

Course Code: CS304
Course Name: COMPILER DESIGN

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 State the role of lexical analyzer. Identify the lexemes and their corresponding tokens in the following statement: printf ("Simple Interest=%f\n", si); (3)

2 Explain any three tools that help a programmer in building a compiler efficiently. (3)

3 Eliminate the ambiguity from the given grammar (3)

E → E*E | E-E | E^E | E/E | E+E | (E) | id.

The associativity of the operators is as given below. The operators are listed in the decreasing order of precedence.

(i) ( )

(ii) / and + are right associative

(iii) ^ is left associative.

(iv) * and – are left associative

4 For what type of grammar, recursive descent parser cannot be constructed? Show the steps involved in recursive descent parsing with backtracking for the string *cad* with the given grammar: S -> cAd A -> ab | a (3)

PART B

Answer any two full questions, each carries 9 marks.

5 a) Trace the output after each phase of the compiler for the assignment statement: **a = b + c * 10**, if variables given are of float type. (6)

b) Show that the following grammar is ambiguous. (3)

bexpr → *bexpr* **OR** *bterm* | *bterm*

bterm → *bterm* **AND** *bfactor* | *bfactor*

bfactor → **NOT** *bfactor* | *(bexpr)* | **TRUE** | **FALSE**

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6 a) Left factor the following grammar and then obtain LL(1) parsing table (6)

E → T+E | T

T → float | float * T | (E)

b) What is the relevance of input buffering in lexical analysis? (3)

7 a) Write Non-recursive predictive parsing algorithm. (5)

b) Write regular expressions for the following languages: (4)

i) All strings over the English alphabet that contain the five vowels in order.

ii) All strings of a's and b's that do not contain the subsequence *abb*.

PART C

Answer all questions, each carries 3 marks.

8 What is handle pruning? Indicate the handles in the reduction of the right sentential form **S S+ a *** to the start symbol using the grammar below: (3)

S -> S S+ | S S * | a

9 What are viable prefixes? For the given grammar S → 0 S 1 |0 1 write all the viable prefixes for the string 00001111 (3)

10 Give the S-attributed SDD of a simple desk calculator and show annotated parse tree for the expression (3+4)*(5+6). (3)

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11 Write a translation scheme for performing type checking of statements. (3)

PART D

Answer any two full questions, each carries 9 marks.

12 a) Construct canonical collection of LR(1) items for the following grammar: (5)

S → AA

A → Aa | b

b) Differentiate between S-attributed and L-attributed definitions with suitable examples. (4)

13 a) Write the SDD for a simple type declaration and draw the annotated parse tree for the declaration **float a, b, c**. (5)

b) Construct SLR parsing table for the grammar A → a | (A). (4)

14 a) Using operator precedence relations, parse the string id + (id * id). (5)

b) Construct DAG for the expression (a/10 + (b -10))*(a/10 + (b-10)). Also write the sequence of instructions used for the DAG construction. (4)

PART E

Answer any four full questions, each carries 10 marks.

15 a) Using necessary figure, illustrate how the caller and callee cooperate in (6)

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15 a) Using necessary figure, illustrate how the caller and callee cooperate in (6)

managing various tasks in stack allocation strategy when a procedure is activated.

b) Explain copy propagation with an example. (4)

16 a) Write SDD to produce three-address code for Boolean expressions and obtain the three-address code for the statement given below: (6)

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while a < b do
    if c < d then
      x = y + z
    else
      x = y – z
```

b) Explain common sub expression elimination with an example. (4)

17 a) Identify any four issues in the design of a Code Generator. (6)

b) Write the three address code sequence for the statement x=y*z + y*-z. Also give its triple representation. (4)

18 Write the code generation algorithm. Using this algorithm generate code sequence for the expression **x = (a – b) + (a + c)**. (10)

19 a) With suitable example of a basic block, explain the code-improving transformations of a basic block. (6)

b) Describe the various fields in an activation record. (4)

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