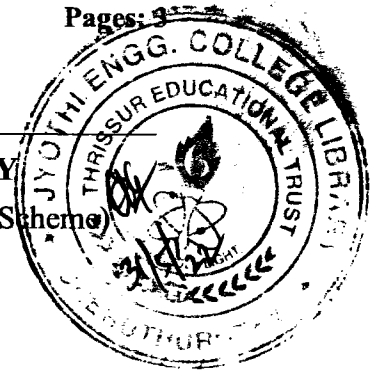


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (S,FE) Examination May 2022 (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 relevance of symbol table in the compilation process. (3)
- 2 Define tokens, lexemes and patterns. (3)
- 3 Show that the following grammar is ambiguous by giving two parse trees for the string $abab$. Here ϵ is the empty string. (3)

$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$
- 4 Explain backtracking with an example. (3)

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

- 5 a) What is the role of input buffering in lexical analysis? Explain with a figure. (4)
- b) Write notes on compiler writing tools. (5)
- 6 Using the sentence $id^*-(id)\uparrow id$, prove that the following grammar is ambiguous. (9)
 Also rewrite the grammar by removing the ambiguity. Here \uparrow denotes exponentiation operator.

$$E \rightarrow E + E \mid E - E \mid E * E \mid E / E \mid E \uparrow E \mid (E) \mid -E \mid id$$

- 7 a) Check whether the following grammar is LL(1) by constructing a parse table. (5)

$$S \rightarrow iEtSS' \mid a$$

$$S' \rightarrow eS \mid \epsilon$$

$$E \rightarrow b$$

- b) Draw a transition diagram to recognize the following set of keywords: (4)
 $\{begin, end, else, elif, do, break, continue, case\}$

PART C*Answer all questions, each carries 3 marks.*

- 8 Define the precedence relations used in operator precedence grammar. (3)
- 9 What are the conflicts that could arise during shift-reduce parsing? (3)

- 10 Distinguish between inherited and synthesized attributes. (3)
- 11 Define (i) type system (ii) sound type system (iii) strongly typed language (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 Construct the LALR parsing table for the following grammar: (9)

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

$$T \rightarrow TF \mid F$$

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

- 13 a) Write a syntax directed translation scheme for a simple desk calculator. (4)
- b) Give an annotated parse tree for the input string $23*5+4$. (5)
- 14 a) Consider the following grammar: (7)

$$S \rightarrow a \mid (T)$$

$$T \rightarrow T, S \mid S$$

For the string $(a, (a, a))$, show the actions of a shift reduce parser. Clearly indicate the stack and input configurations at each step.

- b) Which are the two forms of type checking? (2)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) What are activation trees? Give an example. (3)
- b) With relevant figures, explain how the activation records are managed in stack allocation and heap allocation strategies. (7)
- 16 a) Write the code generation algorithm. (5)
- b) Translate the following code fragment to three-address code: (5)

while $(a > b) \ \&\& \ (a < 2 * c - 10)$ do

$a = b + c$

- 17 Consider the assignment statement $a = b * -c + b * -c$. Here '-' is the unary minus or the negation operator. Translate the statement into (10)
- syntax tree.
 - quadruples.
 - triples.
 - indirect triples

- 18 a) Explain the problems that might be encountered during code generation. (6)
b) With an example, explain copy propagation and dead code elimination. (4)
- 19 Translate the expression $W := (A-B) + (A-C) + (A-C)$ into three address code sequence and then generate the machine code for the three address code. (10)
- 20 a) Construct DAG for the following expression, (5)
 $((a-b) - ((a-b)*(a+b))) + ((a-b)*(a+b))$
b) How do you derive the cost of an instruction? Illustrate with a sample code fragment. (5)
