

Code No: 156AH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, March - 2024

COMPILER DESIGN

(Common to CSE, ECM, CSE(DS))

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a) What do you understand by backtracking? [2]
- b) How does the lexical analyzer handle whitespace and comments in source code? [3]
- c) How can parser generators help in automating the generation of parsers for programming languages? [2]
- d) What are the advantages and disadvantages of top-down parsing? [3]
- e) How are switch statements represented in intermediate code? [2]
- f) What are the different evaluation orders for Syntax-Directed Definitions? [3]
- g) Define basic blocks and flow graphs. [2]
- h) How does the run-time environment provide access to nonlocal data on the stack? [3]
- i) What do you understand by partial-redundancy elimination? [2]
- j) List the applications of data-flow analysis in compiler optimization. [3]

PART – B**(50 Marks)**

- 2.a) Suppose a source program contains the assignment statement
 $position = initial + rate * 60$
Show the translation of this assignment statement in each phase of the compiler.
- b) Draw the transition diagrams for unsigned numbers and whitespace. [5+5]

OR

- 3.a) Write a Lex program that copies a file, replacing each non-empty sequence of white space with a single blank.
 - b) Suppose we have two tokens, the keyword `if` and identifiers, which are strings of letters other than `if`. Show (i) the NFA for these tokens and (ii) the DFA for these tokens. [5+5]
- 4.a) What language is generated by the following grammars? In each case justify your answer.
(i) $S \rightarrow 0 S 1 \mid 0 1$ (ii) $S \rightarrow + S S \mid - S S \mid a$
 - b) Construct recursive-descent parsers for the following grammar. [5+5]
 $S \rightarrow S (S) S \mid \epsilon$

OR

5. Show that the following grammar is LL(1) but not SLR(1).
 $S \rightarrow A a A b \mid B b B a$
 $A \rightarrow \epsilon$
 $B \rightarrow \epsilon$ [10]
- 6.a) Construct a syntax-directed translation scheme to translate postfix arithmetic expressions into equivalent prefix arithmetic expressions.
 b) Give an SDD to differentiate expressions such as $x * (3 * x + x * x)$ involving the operators + and *, the variable x, and constants. Assume that no simplification occurs, so that, for example, $3 * x$ will be translated into $3 * 1 + 0 * x$. [5+5]
- OR**
- 7.a) Show how to transform a three-address code sequence into one in which each defined variable gets a unique variable name.
 b) Write the unification algorithm of type checking. [5+5]
- 8.a) Explain the static and dynamic storage allocation.
 b) Write Cheney's copying collector algorithm in the context of trace-based collection. [5+5]
- OR**
- 9.a) Discuss the design goals for garbage collectors.
 b) Generate code for the following three-address sequence assuming that p and q are in memory locations.
 $y = *q$
 $q = q + 4$
 $*p = y$
 $p = p + 4$ [5+5]
- 10.a) Discuss the lazy-code-motion problem.
 b) Show that every depth-first presentation for every nonreducible flow graph has a retreating edge that is not a back edge. [5+5]
- OR**
11. Explain the following terms with suitable examples. (a) Copy motion (b) Induction variables and reduction in strength. [5+5]

---ooOoo---