

R18

Code No: 155EG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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

COMPILER DESIGN

(Computer Science and Engineering – Artificial Intelligence and Machine Learning)

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) Compare Compiler and an Interpreter. [2]
- b) What is the role of Lexical Analyzer in a Compiler? [3]
- c) What are context-free grammars (CFGs). [2]
- d) Eliminate ambiguities in the following grammar.
 $S \rightarrow iEtS \mid iEtSeS \mid a \quad E \rightarrow b \mid c \mid d$ [3]
- e) Define S- attributed and L-attributed grammars. [2]
- f) Apply translation scheme to generate Three Address code for: $a < b$ or $c < d$. [3]
- g) What are the applications of DAG? [2]
- h) What is fragmentation in the context of heap memory, and how does it affect memory utilization? [3]
- i) Define data-flow analysis. [2]
- j) Define constant propagation with example. [3]

PART – B

(50 Marks)

2. Explain various phases of compiler considering the example: $i:=i*70+j+2$. [10]

OR

- 3.a) Describe about the LEX tool in detail. [5]
- b) Design a DFA that accepts the language over the alphabet $\Sigma = \{0, 1, 2\}$, where the decimal equivalent of the language is divisible by 3. [5]

4. Construct predictive parsing table for the following grammar: $S \rightarrow (L) \mid a \quad L \rightarrow L, S \mid S$ and check whether the string $(a, ((a, a), (a, a)))$ belongs to that language or not. [10]

OR

5. Construct an SLR parsing table for the given grammar: $E \rightarrow E+E \mid E^*E \mid (E) \mid id$ and parse the sentence $(id+id)^*id$. [10]

- 6.a) Write the SDD for expressions and construct a syntax tree for the expression $a-4*c$. [5]
- b) Write the translation scheme for type checking of function declaration. [5]

OR

- 7.a) Translate the expression $-(a+b)*(c+d)+(a+b+c)$ into quadruple, triple and indirect triple. [5]
- b) How are conditional statements and loops translated into Three-Address Code? [5]

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- 8.a) Explain about the storage allocation strategies.
b) What is meant by activation of procedure? How it can be represented with activation tree and record? Explain with quick sort example. [5+5]

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- 9.a) Explain the design issues for code generator phase.
b) Apply a code generation algorithm for the expression $d := (a-b) + (a-c) + (a-c)$. [5+5]

- 10.a) What is code optimization? Compare machine-dependent and independent code optimization techniques.

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- b) Illustrate data flow analysis with curated graphs and examples. [5+5]

- 11.a) Illustrate the concept of Loop Optimization techniques with examples.

- b) Generate the flow-graphs for the following expressions: [5+5]

$S \rightarrow id := E \mid S; S \mid \text{if } E \text{ then } S \text{ else } S \mid \text{do } S \text{ while } E$
 $E \rightarrow id + id \mid id$

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