

**III B. Tech I Semester Regular/Supplementary Examinations, March – 2021****COMPILER DESIGN**

(Computer Science and Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **FOUR** Questions from **Part-B**
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**PART -A****(14 Marks)**

1. a) Discuss about compiler writing tools. [2M]
- b) Define a parse tree. How can you say that given grammar is ambiguous? [2M]
- c) What is a Look ahead operator? Mention its purpose in LALR. [2M]
- d) What is intermediate code generation? [3M]
- e) What meant by basic blocks? Where they are used? [3M]
- f) Discuss the contents of an activation record. [2M]

**PART -B****(56 Marks)**

2. a) What are different phases of a Compiler? Explain with a diagram. [7M]
- b) Specify the need and role of Lexical Analyzer. [7M]
3. a) What are different parsing operations in shift reduce parser? Perform shift reduce parsing method for the input string  $id_1+id_2*id_3$ . [7M]
- b) What is mean by left recursion? How to eliminate left recursion for the following grammar:  $E \rightarrow E+T/T$ ,  $T \rightarrow T*F/F$ ,  $F \rightarrow (E)/id$ . [7M]
4. a) Explain grammar with an example. How LR parsers can handle ambiguity? What is the role of priority and associativity in it? [7M]
- b) What is the Syntax Directed Translation (SDT)? How attributed grammars are used to generate intermediate code for expressions using SDTs? [7M]
5. a) Give the various representations of 3 address code for,  $A=B+C*(D/E)-(F+6)*9$ . [7M]
- b) Write a translational scheme to perform type checking of statements. [7M]
6. a) List the different storage allocation strategies and explain them. [7M]
- b) Explain in detail a simple stack allocation scheme. [7M]
7. a) What is a DAG? Mention its applications. [7M]
- b) Explain the characteristics of peephole optimization. [7M]

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**PART -A****(14 Marks)**

1. a) What are different errors can be occurred in different phases? [2M]
- b) Differentiate between regular expression and context free grammar. [2M]
- c) Define attributes of grammar symbols. [2M]
- d) What is dangling else problem? [3M]
- e) List the characteristics of peephole optimization. [3M]
- f) Discuss the contents of activation record. [2M]

**PART -B****(56 Marks)**

2. a) What is a regular expression? Design a transition diagram for keywords. [7M]
- b) Why lexical and syntax analyzers are separated? Explain in detail. [7M]
3. a) Differentiate between right most derivation and left most derivation with an example. [7M]
- b) Construct a parse tree for the given grammar: [7M]  
 $S \rightarrow iCtS$   
 $S \rightarrow iCtSeS$   
 $S \rightarrow a$   
 $C \rightarrow b$ .
4. a) Construct a LALR parsing table for following grammar:  $S' \rightarrow S$  [7M]  
 $S \rightarrow CC$   
 $C \rightarrow cC/d$ .
- b) What are the limitations in SLR parser? How they are rectified in CLR and LALR parsers? [7M]
5. a) Differentiate between intermediate code and code generation. [7M]
- b) Explain the different intermediate code generation techniques. [7M]
6. a) Write the algorithm to construct flow graph for finding Sum of 'N' natural numbers. [7M]
- b) Define induction variables. Illustrate elimination of induction variable with an example. [7M]
7. a) Illustrate how a machine model affects code generation? [7M]
- b) Explain the basic functionalities of IN, OUT and KILL in data flow analysis. [7M]

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**PART -A**

(14 Marks)

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|-------|--|------|
| 1. a) | What are compilers? Why we need compilers?                   | [2M] |
| b)    | Define left factoring.                                       | [2M] |
| c)    | Discuss the role of handle in parsing.                       | [2M] |
| d)    | Generate abstract syntax tree for $a-4*c/10$ .               | [3M] |
| e)    | What do you meant by reduction in strength? Give an example. | [3M] |
| f)    | List major problems in code generation.                      | [2M] |

**PART -B**

(56 Marks)

- |       |  |      |
|-------|--|------|
| 2. a) | What are the cousins of Compiler? Explain their role in language processing.   | [7M] |
| b)    | Write a simple 'C' program to read and display a string. Design lexical analyzer to identify tokens in it.                 | [7M] |
| 3. a) | Differentiate between top down parsing and bottom up parsing techniques.   | [7M] |
| b)    | Construct the top down parser using recursive descent parser.  | [7M] |
| 4. a) | Write the algorithm for construction of a canonical LR parsing table.  | [7M] |
| b)    | Construct set of LR(1) items for a grammar given below<br>$S' \rightarrow S$<br>$S \rightarrow CC$<br>$C \rightarrow cC/d$ | [7M] |
| 5. a) | What do you meant by abstract translation scheme? Discuss about its structure.   | [7M] |
| b)    | List the production and semantic action for Boolean expressions using abstract translation scheme.                         | [7M] |
| 6. a) | Why code optimization is required? Discuss about different types of code optimization techniques.                          | [7M] |
| b)    | What is a flow graph? Describe where it is used?   | [7M] |
| 7. a) | Explain the various optimization techniques used for peephole.   | [7M] |
| b)    | Write about Register Allocation and Assignment.  | [7M] |

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**PART -A****(14 Marks)**

1. a) Define Lex tool? [2M]
- b) Give the example of ambiguous grammar? [2M]
- c) What are LR grammars? [2M]
- d) Write various intermediate code representations. [3M]
- e) How storage allocation is done in symbol table. [3M]
- f) Why code optimization is optional phase. [2M]

**PART -B****(56 Marks)**

2. a) Explain the approach for designing of lexical analyzer. [7M]
- b) Differentiate: (i) Pass and phase of a compiler; (ii) Front end and back end of a compiler. [7M]
3. a) For an input string  $id_1+id_2*id_3$  perform parsing action using shift-reduce. [7M]
- b) State and explain the rules to construct first and follow functions for the given grammar;  $E \rightarrow E+T/T$ ,  $T \rightarrow T*F/F$ ,  $F \rightarrow (E)/id$ . [7M]
4. a) Write the algorithm for construction of a Simple LR parsing table. [7M]
- b) Construct a set of LR(0) items for a grammar given below  $S \rightarrow L=R$  [7M]
  - $S \rightarrow R$
  - $L \rightarrow *R$
  - $L \rightarrow id$
  - $R \rightarrow L$ .
5. a) Differentiate between parse tree and syntax tree. [7M]
- b) Write the syntax- directed translation scheme to construct syntax trees. [7M]
6. a) Generate the control flow for if and while statements using Boolean expression. [7M]
- b) What is meant by Back patching? What are functions of it? [7M]
7. a) Write about implementation of a simple stack- allocation scheme. [7M]
- b) Differentiate between register descriptors and address descriptors. [7M]

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