

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech VI SEMESTER END EXAMINATIONS (REGULAR) - JULY 2023

Regulation: UG-20

COMPILER DESIGN

Time: 3 Hours

(COMMON TO CSE(CS) | CSE(DS))

Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

1. (a) What are the various phases of the compiler? Write down the output of each phase for expression $a:=b+c*60$. [BL: Understand| CO: 1|Marks: 7]
- (b) Construct the equivalent finite state transition diagram for the given regular expression $(a/b)^*abb$. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Give the parse tree for the string $w = (a,(a,(a,a)))$ by following the given grammar.
 $S \rightarrow (L) \mid a$
 $L \rightarrow L, S \mid S$ [BL: Understand| CO: 2|Marks: 7]
- (b) Compute the FIRST and FOLLOW of the given grammar [BL: Apply| CO: 2|Marks: 7]
 $E \rightarrow E + T \mid T$
 $T \rightarrow T F \mid F$
 $F \rightarrow F * \mid a \mid b$

MODULE – III

3. (a) Construct a syntax directed definition for constructing a syntax tree for assignment statements.
 $S \rightarrow id:=E$
 $E \rightarrow E1 + E2$
 $E \rightarrow E1 * E2$
 $E \rightarrow E1$
 $E \rightarrow (E1)$
 $E \rightarrow id$ [BL: Understand| CO: 3|Marks: 7]
- (b) Apply the S-attribute definition and construct syntax tree for a simple expression grammar involving only the binary operators + and -. As usual, these operators are at the same precedence level and are jointly left associative. All nonterminal have one synthesized attribute node, which represents a node of the syntax tree.
Production: $E \rightarrow E1 + T$ $E \rightarrow T$ $T \rightarrow (E)$ $T \rightarrow id \mid num$ [BL: Apply| CO: 3|Marks: 7]
4. (a) What is a syntax tree? Describe construction of syntax tree for expression? Give example to support your description. [BL: Understand| CO: 4|Marks: 7]
- (b) Generate the three address statement for the given expression $a = (b + c)*(b + c)*2$. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) What is symbol table? What type of information is stored in it? Illustrate type checking with necessary diagram. [BL: Understand| CO: 5|Marks: 7]
- (b) Analyze the differences among the various kind of memory in runtime storage allocation strategies. [BL: Apply| CO: 5|Marks: 7]
6. (a) Discuss how names are stored in symbol table? Illustrate the quick sort example for storage allocation strategies. [BL: Understand| CO: 5|Marks: 7]
- (b) How type checker can handle arrays, pointers, statements, and functions? Explain about specification of simple type checker. [BL: Understand| CO: 5|Marks: 7]

MODULE – V

7. (a) What are the principal sources of optimization? Explain in detail with suitable examples. [BL: Understand| CO: 6|Marks: 7]
- (b) Construct the basic block for the given three address code.
- ```
1 a = 1
2 b = 2
3 L0 c = a + b
4 d = c - a
5 If c < d goto L2
6 L1 d = b + d
7 If d < 1 goto L3
8 L2 b = a + b
9 e = c - a
10 If e = 0 goto Lo
11 a = b + d
12 b = a - d
13 goto L4
14 L3 d = a + b
15 e = e + 1
16 goto L3
17 L4 return
```
- [BL: Apply| CO: 6|Marks: 7]
8. (a) Explain the following with respect to code generation phase.
- i) Instruction selection
  - ii) Register allocation
  - iii) Evaluation order
- [BL: Understand| CO: 6|Marks: 7]
- (b) Consider
- ```
sum=0;
for(i=0;i<=10;i++)
sum=sum+a[i];
```
- perform DAG representation on the given basic block. [BL: Apply| CO: 6|Marks: 7]