Reg. No.														

B.Tech. DEGREE EXAMINATION, MAY 2024
Sixth Semester

18CSC304J – COMPILER DESIGN
(For the candidates admitted during the academic year 2018-2019 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40ᵗʰ minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer ALL Questions

	Marks	BL	CO	PO

1. The machine code which can be connected together with object files and library files is _____. *(Marks 1, BL 1, CO 1, PO 1)*
   (A) Preprocessor   (B) Compiler
   (C) Linker   (D) Loader

2. Which of the following regular expression denotes any number of 0's, followed by any number of 1's and any number of 2's? *(Marks 1, BL 2, CO 1, PO 1)*
   (A) $(0+1+2)^*$ (B) $0^*1^*2^*$
   (C) $(0^*+1^*+2^*).0$ (D) $(0+1^*)2$

3. The minimum number of states to recognize binary strings not ending with "000" _____. *(Marks 1, BL 2, CO 1, PO 1)*
   (A) 5   (B) 4
   (C) 3   (D) 6

4. A programmer writes a program to multiple two numbers instead of dividing them. This error can be found in _____ phase of compiler. *(Marks 1, BL 1, CO 1, PO 1)*
   (A) Lexical   (B) Syntax
   (C) Cannot be determine by any   (D) Semantic

5. What are the symbols that can be first(s) in the given production? *(Marks 1, BL 1, CO 2, PO 2)*
   $S \rightarrow F|H$
   $F \rightarrow p|c$
   $H \rightarrow d|c$
   (A) {p, c}   (B) {d, c}
   (C) {p, d, c}   (D) {p}

6. Which of the following is not an error recovery strategy? *(Marks 1, BL 1, CO 2, PO 2)*
   (A) Phrase recognition   (B) Phrase level recovery
   (C) Panic mode   (D) Error production

7. The parsing technique that avoids backtracking is _____. *(Marks 1, BL 1, CO 2, PO 2)*
   (A) Bottom up parsing   (B) Predictive parsing
   (C) Top down parsing   (D) Recursive descent parsing

8. Top down parser generates _____. *(Marks 1, BL 1, CO 2, PO 2)*
   (A) Rightmost derivation   (B) Rightmost derivation in reverse
   (C) Leftmost derivation   (D) Leftmost derivation in reverse

9. Handle always occurs _____.
   (A) On the top of a stack   (B) At the bottom of the stack
   (C) Inside the stack   (D) Not one the stack

   1 1 3 2

10. Which of the following is an operator type of grammar?
    (A) A → AaBa   (B) A → AB
    (C) A → AB | ε   (D) A → ABCa

    1 2 3 2

11. The symbols present in leading(A) in the following grammar are _____.
    A → Bx|y
    B → yA|z
    (A) x, y   (B) x, y, z
    (C) y   (D) y, z

    1 2 3 3

12. Which is the most powerful parser?
    (A) Simple LR   (B) Canonical LR
    (C) Lookahead LR   (D) Shift reduce

    1 1 3 2

13. Heap allocation is a part of the runtime environment in languages with
    (A) Dynamic data structure   (B) Dynamic scope
    (C) Recursion   (D) Global variables

    1 2 4 2

14. Replacing a*2 by x<<1 is an example for
    (A) Simplification of algebraic   (B) Accessing machine instruction
        expression
    (C) Code motion   (D) Strength reduction

    1 2 4 3

15. Which of the below mentioned statements is not a three address code?
    (A) a = 3   (B) a = a + b
    (C) a = b + 3 + c   (D) a = b

    1 1 4 2

16. SDT scheme is desirable because it is _____.
    (A) Based on syntax   (B) Independent of any implementation
    (C) Easy to write   (D) Unable to modify

    1 1 4 2

17. Which of following produces no executable code when complied?
    (A) Assignment statement   (B) Input and output
    (C) Structural statement   (D) Declaration

    1 1 5 2

18. Which of the following is not a NP complete problem?
    (A) Register allocation   (B) Evaluation order
    (C) Memory assignment   (D) Instruction selection

    1 1 5 2

19. Replacing a = 3+37 by a = 40 is _____.
    (A) Algebraic simplification   (B) Elimination of redundant instruction
    (C) Strength reduction   (D) Constant folding

    1 1 5 2

20. In algebraic expression simplification replacing a = a+1 can be done using
    (A) a   (B) ADD A, 1
    (C) INC a   (D) ADD 1, A

    1 2 5 2

PART – B (5 × 4 = 20 Marks)
Answer ANY FIVE Questions

	Marks	BL	CO	PO

21. Elucidate the roles of forward and lexeme points in input buffering scheme.   — 4, 3, 1, 1

22. List the functions of preprocessor, linker and loader.   — 4, 3, 1, 1

23. Can the string "banana" be derived from the CFG:

$$S \rightarrow baAB; A \rightarrow B; B \rightarrow na$$

Using recessive descent parsing. Give the limitations of the recursive descent parser.   — 4, 3, 2, 3

24. Eliminate left recursion from the following   — 4, 3, 2, 3
    (i) $S \rightarrow (L) \mid x$
            $L \rightarrow L, S \mid S$
    (ii) $A \rightarrow AB \mid BA \mid a$
            $B \rightarrow b \mid a$

25. Perform shift reduce parsing for the input $id+id+id$ using the grammar $E \rightarrow E+E \mid E*E \mid id$.   — 4, 3, 3, 3

26. Give the syntax directed translation scheme for   — 4, 3, 4, 3
    $L \rightarrow E_n$
    $E \rightarrow E_1 + T$
    $E \rightarrow T$
    $T \rightarrow T_1 \mid F$
    $T \rightarrow F$
    $F \rightarrow (E)$
    $F \rightarrow digit$

27. Brief about various fields in activation record.   — 4, 3, 5, 2

PART – C (5 × 12 = 60 Marks)
Answer ALL Questions

	Marks	BL	CO	PO

28. a. Consider the following code: — 12, 3, 1, 3

```
while (a<b) {
    int x = y + z;
    a + = x ;
}
```

Give the transformation of this code to target code in various phases. Brief about the phases as well.

(OR)

b. Convert the regular expression $RE=ba(a+b)^*ab$ to a DFA. Also mention the rules for computing first Pos, last Pos and nullable.   — 12, 3, 1, 3

29. a. Construct a predictive parsing table for the given gammaer.   — 12, 4, 2, 3

    Exp $\rightarrow$ Exp + Term | Exp – Term | Term
    Term $\rightarrow$ Term * Factor | Term / Factor | Factor
    Factor $\rightarrow$ (Exp) |a

    Also list the rules for computing first ( ) and follow ( ).

(OR)

b. Check whether the following grammers are ambiguous   12   4   2   3

    (i) $S \rightarrow AB \mid C$
             $A \rightarrow aAb \mid ab$
             $B \rightarrow cBb \mid cd$
             $C \rightarrow aCd \mid aDd$
             $D \rightarrow bDc \mid bc$
    (ii) $S \rightarrow AB \mid CD$
             $A \rightarrow aAb \mid \epsilon$
             $B \rightarrow bB \mid \epsilon$
             $C \rightarrow aC \mid bC \mid \epsilon$
             $D \rightarrow bB \mid \epsilon$

30. a. Compute operator precedence relation for the grammer: 12   4   3   3
        $S \rightarrow a \mid (T); T \rightarrow T, b \mid s$
     Give the rules for leading and trailing.

(OR)

b. Examine the effect of CLR parsing on the grammer.   12   4   3   3
        $S \rightarrow L = R \mid R$
        $L \rightarrow * R \mid id$
        $R \rightarrow L$

31. a.i. Elaborate on the issues in the design of code generator.   6   3   4   2

    ii. Analyze the code generator algorithm.   6   3   4   2

(OR)

b. For the expression "$x=a*b+c*d-e$", generate the following   12   3   4   3
    (i)   Three address code
    (ii)   Syntax tree and DAG
    (iii)   Quadruples
    (iv)   Triples

32. a. For the following code identify the leader instruction, its basic block and draw   12   3   5   3
    the control flow block:
    (1) $P = 0$
    (2) $I = 1$
    (3) $P = P + 1$
    (4)   If $P <= 80$ Goto (7)
    (5) $P = 0$
    (6) $I = 5$
    (7) $T1 = I * 2$
    (8) $I = T1 + 1$
    (9)   If $I <= 10$ Goto (3)
    (10) $K = P * 3$
    Also mention the rules for identifying the leader in basic block.

(OR)

b. Describe in detail about global data flow analysis. Give the data flow equations   12   3   5   2
    with analysis for
    (i)   Sequential execution
    (ii)   Branched execution
    (iii)   Loops

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