B.Tech. DEGREE EXAMINATION, JANUARY 2024
Sixth Semester

18CSC304J – COMPILER DESIGN
(For the candidates admitted from the academic year 2020-2021 & 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. In a compiler, keywords of a language are recognized during — 1 2 1 2
   (A) Parsing of the program
   (B) The code generation
   (C) The lexical analysis of the program
   (D) Data flow analysis

2. The output of a lexical analyzer is — 1 2 1 2
   (A) A parse tree
   (B) Intermediate code
   (C) Machine code
   (D) A stream of tokens

3. The number of tokens in the following C statement is — 1 1 1 3
   printf$\left("i = \%d, \& i = \%x", i, \&i\right)$;
   (A) 3
   (B) 26
   (C) 10
   (D) 21

4. The lexical analysis for a modern computer language such as java needs the power which one of the following machine models in a necessary and sufficient sense? — 1 2 1 2
   (A) Deterministic pushdown automata
   (B) Non deterministic pushdown automata
   (C) Finite state automata
   (D) Turning machine

5. Which of the following derivations does a top-down parser use while parsing an input string? The input is assumed to be scanned in left to right order? — 1 2 2 3
   (A) Left most derivation
   (B) Left most derivation traced out in reverse
   (C) Right most derivation
   (D) Right most derivation traced out in reverse

6. A CFG is not closed under — 1 4 2 3
   (A) Iteration
   (B) Concatenation
   (C) Dot operation
   (D) Union operation

7. Parsing is also known as — 1 3 2 3
   (A) Lexical analysis
   (B) Syntax analysis
   (C) Sematic analysis
   (D) Code generation

8. Consider the grammar with non-terminals N = {S, C, C$_1$}, terminals T = {a, b, i, t, e} with 'S' as the start symbol and the following set of rules: — 1 2 2 3
   $S \rightarrow i\,ct\,SS_1 \mid a; \quad S_1 \rightarrow es \mid \in; \quad c \rightarrow b$
   The grammar is not LL(1) because:
   (A) It is left recursive
   (B) It is right recursive
   (C) It is ambiguous
   (D) It is not context free

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9. Which of the following is not an operator grammar?   1 2 3 3
   (A) B→C|d   (B) B→AC|A+D|∈
   (C) B→DaD   (D) B→DaD|aD

10. Consider the following grammar: $A \rightarrow Ba \mid d; b \rightarrow Bx \mid a$ what is LEADING   1 2 3 3
    (A) {x, a}   (B) {a, d, x}
    (C) {a, d}   (D) Cant be determined

11. What is the lookhead symbol of the give production $C \rightarrow aAd.A, f$?   1 3 3 3
    (A) {d|f}   (B) f
    (C) a   (D) &

12. Which of the following statements are false?   1 4 3 3
    (A) LL(1) is a top down parser   (B) LL(1) is top down while LR(k) is
                                           bottom up parser
    (C) LR(k) is top down parser   (D) LR(k) is bottom up parser

13. _____ is a tool that depicts the structure of basic blocks, helps to see the flow of   1 2 4 3
    values flowing among basic blocks.
    (A) DAG   (B) CAG
    (C) SAG   (D) PAG

14. In algebraic expression simplification, $a = a + 1$ can simply be replaced by   1 2 4 3
    _____.
    (A) a   (B) INC a
    (C) DEC a   (D) MUL a

15. Which of the following is not a form of intermediate representation?   1 2 4 3
    (A) Abstract syntax tree   (B) 3-address code
    (C) Directed cyclic graph   (D) Reverse polish notation

16. Code generator uses ___·___ function to determine the status of available registers   1 1 4 3
    and the location of name values.
    (A) setReg   (B) cinReg
    (C) pfReg   (D) getReg

17. Which of the following is not a loop optimization technique?   1 1 5 3
    (A) Elimination   of   common (B) Code motion
        subexpression
    (C) Reduction of strength   (D) Elimination of induction variable

18. How many points are present in the code segment?   1 2 5 3
    $a_1 : i = i * 4$

    $a_2 : i = i * i$

    $a_3 : a = i$
    (A) 3   (B) 1
    (C) 4   (D) 5

19. What form of optimization can be applied on: $a[i + 3] = C[i + 3] * d[i + 3]$ 1 2 5 3
    (A) Elimination   of   common (B) Elimination of dead variable
        subexpression
    (C) No optimization is possible   (D) Elimination of induction variable

20. Which of the optimization is not possible in the given code?

$x = 1$

$y = a * b + 3$

$z = a * b + x + z + 2$

$x = 3$

(A) Constant folding (B) Copy propagation
(C) Renaming variables (D) Elimination of common sub expression

1	2	5	2

	Marks	BL	CO	PO

21. Discuss in detail on compiler construction tools.

4	2	1	2

22. Construct a deterministic finite automata that accepts numbers that are divisible by five.

4	3	1	3

23. Compute FIRST for the following grammar

$S \rightarrow ABCD$

$A \rightarrow a \mid \in$

$B \rightarrow CD \mid b$

$C \rightarrow C \mid \in$

$D \rightarrow Aa \mid d \mid \in$

4	3	2	3

24. Parse the input string "*ibtibtaea*" using shift reduce parsing for the following grammar.

$S \rightarrow iEts \mid iEtSeS \mid a$

$E \rightarrow b$

4	2	3	3

25. Discuss the rules involved in constructing the SLR parsing table.

4	2	3	3

26. Build the syntax tree and DAG for the following expression

$(a * b) + (c - d)^* (a^* b)$

4	2	4	2

27. List the possible transformations that are available in the below code.

```
for (i = 0; i < n; i++)
{
  for (j = 0; j < n; j++)
    {
      if (i%2)
      {
        x += (4 * j + 5 * i);
        y += (7 + 4 * j);
      }
    }
}
```

4	2	4	2

	Marks	BL	CO	PO

28. a. Give the significance of the lexeme begin and forward pointer in input buffering scheme, with pseudo code.

12	2	1	1

(OR)

b. Convert the regular expression $(a \mid b)^* abb$ into a DFA.

12	3	1	1

29. a.i. Compute FIRST and Follow for the following grammar   8 4 2 1

$S \rightarrow ABCD$

$A \rightarrow a \mid \in$

$B \rightarrow CD \mid b$

$C \rightarrow C \mid \in$

$D \rightarrow Aa \mid d \mid \in$

  ii. Consider the following grammar   4 3 2 1

$S \rightarrow (L) \mid a$

$L \rightarrow L, S \mid S$

Construct left most derivation and parse tree for $(a,(a,a))$.

(OR)

  b. Show the following grammar is LL(1) and parse the input string $"baba"$.   12 3 2 1

$S \rightarrow (L) \mid a$

$L \rightarrow L, S \mid S$

30. a. Construct an operator precedence parsing table for the following grammar.   12 4 3 3

$S \rightarrow A + B * C$

$A \rightarrow D * A \mid a$

$B \rightarrow B \wedge A \mid b$

$C \rightarrow D + A \mid e$

$D \rightarrow d$

Is there any conflicts.

(OR)

  b. Perform canonical LR parsing for the following grammar.   12 4 3 3

$S \rightarrow L = R \ / \ R$

$L \rightarrow *R \mid id$

$R \rightarrow L$

31. a.i. Express the sematic rule for productions of Boolean expression write three address   9 4 4 3
code for $if (x < 100 \mid\mid x > 200 \& \& x! = y)$
$x = 0;$

  ii. State the different ways of representing intermediate languages.   3 1 4 3

(OR)

  b.i. Explain the translation scheme to produce three address code for assignment   8 1 4 3
statements.

  ii. Write three address code for the following expression   4 2 4 3

$-(w * x) + (y + z) - (w + x + y + z)$

32. a. Explain in detail about displays. Also explain how variable length data is handled   12 3 5 3
by compilers.

(OR)

  b. Discuss in detail about storage allocation strategies with a block diagram.   12 4 5 3

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