b. Rahul is applying for his dream job in Indian army. His father has brought an advertisement about the eligibility criteria. Rahul can apply in any of the two categories. The first category says height should be greater than 174 cm. The second category says mandatory height should be greater than 174 cm and optional educational qualification. The educational qualification can be Tenth (T) or Higher Secondary (HS) or Under Graduate (UG) or Post Graduate (PG). Design CFG and eliminate left recursion and common prefixes wherever applicable.
[Grammar construction: 6 Marks
Left recursion : 2 Marks
Left Factoring: 4 Marks]

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 3 | 2 | 3 |

30. a. Consider the following grammar
$S \rightarrow AS \mid b$
$A \rightarrow SA \mid a$
Construct the SLR parse table for the grammar. Show the actions of the parser for the input string *abab*.

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 3 | 3 | 3 |

**(OR)**

b. Construct a canonical parsing table for the grammar given below
$E \rightarrow E+T$
$F \rightarrow (E)$
$E \rightarrow T$
$F \rightarrow id$
$T \rightarrow T*F$
$T \rightarrow F$
And parse any string derived from the grammar.

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 3 | 3 | 3 |

31. a. Generate the three address code statement and construct the DAG representation for the expression $I = a + a^*(b+c) - (b+c)^* d$.

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 3 | 4 | 3 |

**(OR)**

b. Discuss in detail on three address code representation with appropriate examples.

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 2 | 4 | 2 |

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

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 2 | 5 | 2 |

**(OR)**

b. Discuss in detail about storage allocation strategies with a block diagram.

| | | | | | |
|---|---|---|---|---|---|
| | | 12 | 2 | 5 | 2 |

* * * * *



| Reg. No. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**B.Tech. DEGREE EXAMINATION, MAY 2023**
Sixth Semester

18CSC304J – COMPLIER 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. What is the minimum number of states to recognize the language $L = \{w \mid w \in (0+1+2)^+\}$?
(A) 1 (B) 3
(C) 4 (D) 2

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 1 | 1 |

2. Which of the following is correct sequence of finite state automata in terms of flexibility?
(A) NFA, DFA, ϵ-NFA (B) DFA, NFA, ϵ-NFA
(C) ϵ-NFA, DFA, NFA (D) ϵ-NFA, NFA, DFA

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 1 | 1 |

3. Entries in symbol table are made in _____.
(A) Semantic analysis (B) Lexical and syntax analysis
(C) Lexical analysis (D) Code generation

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 1 | 1 |

4. Any language accepted by a finite automation is _____.
(A) Only context free (B) Only context sensitive
(C) Only regular (D) Both regular and context free

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 2 | 2 |

5. In which parsing, the parser constructs the parse tree from the start symbol and transforms it into input symbol
(A) Bottom-up parser (B) Top-down parser
(C) Both bottom-up and top-down parser (D) LR parser

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 2 | 1 |

6. Which of the following is true?
(A) * has higher precedence than + (B) – has higher precedence than *
(C) + and * have same precedence (D) + has higher precedence than *

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 2 | 2 |

7. A context free grammar is not closed under
(A) Dot operation (B) Union operation
(C) Concatenation (D) Iteration

| | | | | |
|---|---|---|---|---|
| | 1 | 1 | 2 | 1 |

8. Parsing is also known as
(A) Lexical analysis (B) Syntax analysis
(C) Semantic analysis (D) Code generation

9. A bottom-up parser generates _____. 1 1 3 1
   (A) Right most derivation (B) Right most derivation in reverse
   (C) Left most derivation (D) Left most derivation in reverse

10. What is the similarity between LR, LALR and SLR? 1 1 3 1
   (A) Use same algorithm, but different parsing table (B) Same parsing table, but different algorithm
   (C) Their parsing tables and algorithm are similar but uses top-down approach (D) Both parsing tables and algorithm are different

11. Which is not a shift reduce parser action? 1 1 3 1
   (A) Shift (B) Goto
   (C) Reduce (D) Accept

12. LR parser construct a _____ type of derivation. 1 1 3 1
   (A) MMD (B) RMD
   (C) LMD (D) CLR

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

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

15. Which of the following is not a form of intermediate representation? 1 1 4 2
   (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 and the location of name values. 1 1 4 1
   (A) setReg (B) cinReg
   (C) pfReg (D) getReg

17. Which optimization technique is used to reduce the multiple jumps? 1 1 5 1
   (A) Latter optimization technique (B) Peephole optimization technique
   (C) Local optimization technique (D) Code optimization technique

18. The graph that shows basic blocks and their successor relationship is called 1 1 5 1
   (A) Dag (B) Flow graph
   (C) Control graph (D) Hamiltonian graph

19. Which is not part of runtime memory subdivisions? 1 1 5 2
   (A) Stack (B) Heap
   (C) Static data (D) Access link



20. Which of the following symbol table implementation makes efficient use of memory? 1 1 5 2
   (A) List (B) Search tree
   (C) Hash table (D) Self-organizing list

**PART – B (5 × 4 = 20 Marks)** Marks BL CO PO
Answer **ANY FIVE** Questions

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.i. Build a grammar without left recursion for the following 2 3 2 3
   $A \rightarrow ABd \mid Aa \mid a$
   $B \rightarrow Be \mid b$

   ii. Build the grammar by doing left factoring for the following grammar 2 3 2 3
   $A \rightarrow aAB \mid aA \mid a$
   $B \rightarrow bB \mid b$

24. Explain the parsing techniques with a hierarchical diagram. 4 2 2 2

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 4 3 4 3
   $(a * b) + (c - d)^* (a^* b)$

27. Discuss in detail on stack storage allocation. 4 2 5 3

**PART – C (5 × 12 = 60 Marks)** Marks BL CO PO
Answer **ALL** Questions

28. a. Discuss in detail on phases of compiler and write down the output of each phase for the expression $a := b + c * 50$. 12 2 1 2

**(OR)**

   b. Construct DFA for the regular expression $ba(a+b)^* ab$ using first pos, last pos and follow pos. 12 3 1 3

29. a. Construct predictive parsing table for the grammar, 12 3 2 3
   $E \rightarrow E + T \mid T$
   $T \rightarrow T * F \mid F$
   $F \rightarrow (E) \mid id$
   And parse the input $id + id * id$

**(OR)**