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B.Tech. DEGREE EXAMINATION, JUNE 2023

Fifth Semester

18CSC362J - 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 40 minutes.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours   **Max. Marks: 100**

Part - A (20 × 1 Marks = 20 Marks)
Answer All Questions

		Marks	BL	CO

1. The regular expression $(0|1)*(0|1)$ represents a language with   1   2   1
   (A) Nonempty binary strings   (B) Empty and nonempty binary strings
   (C) Odd nonempty strings   (D) Even nonempty strings

2. The total number of states to build the given language using DFA: L={w|w has   1   2   1
   exactly 2 a's and at least 2 b's}
   (A) 10   (B) 11
   (C) 12   (D) 13

3. Which of the following is not a regular expression?   1   2   1
   (A) $[(a+b)*-(aa+bb)]*$ (B) $[(0+1)-(0b+a1)*(a+b)]*$
   (C) $(01+11+10)*$ (D) $(1+2+0)*(1+2)*$

4. Regular expression $\Phi*$ is equivalent to   1   2   1
   (A) ϵ (B) Φ
   (C) 0   (D) 1

5. For the grammar rules given below what is the FIRST(S) S ->Aa|bB, A->c|ϵ 1   2   2
   (A) b,c   (B) a,c
   (C) a,b,c   (D) a,b,c,ϵ

6. Grammar of the programming is checked at which phase of compiler?   1   1   2
   (A) Lexical analysis   (B) Syntax analysis
   (C) Semantic analysis   (D) Syntax directed translation

7. Which of the following regular expression operator has highest precedence   1   2   2
   (A) Concatenation   (B) Union
   (C) Positive closure   (D) Kleene closure

8. In which parsing, the parser constructs the parse tree from the start symbol and   1   2   2
   transforms it into the input symbol
   (A) Bottom-Up Parser   (B) Top-Down Parser
   (C) Both a & b   (D) LR PARSER

9. The grammar A ⊐ Ax | (A) | ϵ is not suitable for predictive-parsing because the   1   2   3
   grammar is?
   (A) Left factoring   (B) Left recursive
   (C) Right recursive   (D) An operator grammar

10. For the grammar, E ⊏ EE | (E) | ϵ, number of parse trees to produce empty string is?   1   2   3
    (A) One   (B) Two
    (C) Three   (D) Infinite

11. Which grammar rules violate the requirements of an operator grammar? `1  2  3`
    1. E -> FG
    2. F-> E s F
    3. G-> F t H p
    4. H-> ε
    (A) 1 only
    (B) 1 and 3 only
    (C) 1 and 4 only
    (D) 1, 3 and 4 only

12. A form of recursive descent parsing that does not require any back-tracking is known as? `1  2  3`
    (A) recursive parsing
    (B) non-recursive parsing
    (C) predictive parsing
    (D) non-predictive parsing

13. Which statement is an abstract form of intermediate code? `1  2  4`
    (A) 3- address
    (B) 2-address
    (C) address
    (D) Intermediate code

14. In parse tree, leaf nodes are called? `1  1  4`
    (A) terminals
    (B) non-terminals
    (C) sub-terminals
    (D) half-terminals

15. The interior node of syntax tree is `1  2  5`
    (A) Operators
    (B) Keywords
    (C) both a and b
    (D) const

16. A latch is constructed using which two cross coupled? `1  2  5`
    (A) AND OR gates
    (B) AND gates
    (C) NAND and NOR gates
    (D) NAND gates

17. Which is not part of runtime memory subdivision? `1  2  6`
    (A) Stack
    (B) Heap
    (C) Static data
    (D) Access link

18. In which storage allocation strategy size is required at compiler time? `1  2  6`
    (A) Static allocation
    (B) Dynamic allocation
    (C) Stack allocation
    (D) stack,static allocation

19. _____ is a tool that depicts the structure of basic blocks, helps to see the flow of values flowing among the basic blocks, and offers optimization `1  2  5`
    (A) DAG
    (B) CAG
    (C) SAG
    (D) PAG

20. The graph that shows basic blocks and their successor relationship is called `1  2  5`
    (A) DAG
    (B) Flow graph
    (C) control graph
    (D) Hamiltonion graph

Part - B (5 × 4 Marks = 20 Marks) `Marks  BL  CO`
Answer **any 5** Questions

21. The two tests schemes can be reduced to one in input buffering technique? justify your answer with an algorithm. `4  2  1`

22. Raju is authoring a book on compiler. He makes sure that the first page is an index page followed by two acknowledgement pages. Design a DFA for the language L=all strings over {a,b}. `4  3  2`
    Note: index page and acknowledgment pages are referred to strings 'a', 'b' respectively.

23. Eliminate left recursion and left factoring in the following grammar: `4  3  3`
    X -> Ya | b | c
    Y -> Yc | Yd | a
    Z -> aZX | bXc | aZc

24. Check the following grammar is ambiguous or not by parsing the input string "a(a)aa": `4  1  3`

25. Write an inherited attribute semantic rule for following production and draw syntax tree for double a,b,c `4  3  5`
    D → TL
    T → int
    T → float
    T → double
    L → L1, id
    L → id

26. Find LEADING() and TRAILING() for all the non-terminals in the following grammar: `4  3  4`
    A -> A − B | B
    B-> B / C | B
    C -> C * D | D
    D -> (A) | x | y

27. Discuss the various peephole optimization techniques in detail. `4  3  6`

Part - C (5 × 12 Marks = 60 Marks) `Marks  BL  CO`
Answer **All** Questions

28. a) Consider the input c=a+b*5. With a neat sketch, illustrate how the input is transformed into assembly code, using all the phases of compiler. `12  3  1`
    (OR)
    b) Describe the structure of LEX program with example

29. a) Find the canonical collection of LR(0) items for the following grammar: `12  1  3`
    S-> aS | bS
    (OR)
    b) For the given grammar identify
    S → CC C → cC | d i. First () ii. Follow ()

30. a) Consider the grammar: `12  4  2`
    A -> pqC | pBs | pAD
    B-> qB | ε
    C -> s | ε
    D-> p | q | ε
    Check whether the following inputs are accepted or not by the grammar using recursive decent parsing:
    i) pqqp
    ii) ppqqss
    (OR)
    b) For the given grammar S→ 0S1 | 01 , Write a derivation and draw parse tree for the string w= 0515

31. a) Describe the backpatching technique for flow of control statements. `12  3  4`
    (OR)
    b) Describe the various methods of implementing the three address statements with an example

32. a) Describe in detail about optimization of basic blocks with example `12  3  5`
    (OR)
    b) Illustrate in detail about the code generation algorithm with an example.

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