



Daffodil International University
 Faculty of Science & Information Technology
 Department of Computer Science and Engineering
 Final Examination, Spring 2024
 Course Code: CSE 331 , Course Title: Compiler Design
 Level: 4 Term: 1 Batch: 59

Time: 2:00 Hrs

Total Marks: 40

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.		$\text{Expr} \rightarrow \text{Expr} + \text{Term} \mid \text{Term}$ $\text{Term} \rightarrow \text{Term} * \text{Factor} \mid \text{Factor}$ $\text{Factor} \rightarrow (\text{Expr}) \mid \text{id}$		CO2
	a)	Convert the given left-recursive grammar into right-recursive grammar.	[3]	
	b)	Find FIRST() and FOLLOW() for the right-recursive grammar.	[3]	
	c)	Check whether the right-recursive grammar is LL(1) parser or not	[4]	
2.	a)	Produce Canonical Table from the following grammar $S \rightarrow L = R$ $L \rightarrow * R \mid \text{id}$ $R \rightarrow L$	[6]	CO2
	b)	Suppose that the input string is $\text{id} = * \text{id}$. Find whether the input string is accepted or rejected for the given (2a) LR(0) Parser.	[4]	
3.	a)	Convert the following arithmetic expression into various intermediate representations: $((\text{rate} * (\text{vat} + \text{tax})) - ((\text{cost} * \text{tax}) + (\text{revenue} + (\text{vat} + \text{tax}))))$ a) Represent the expression using Three Address Code. b) Represent the expression using Quadruples. c) Implement a Triples data structure to represent the expression. d) Construct the syntax tree for the expression. e) Create a Directed Acyclic Graph (DAG) for the expression.	[10]	CO3

4.	a)	Consider the following three address codes and answer the questions.	[10]	CO3
		1. $x := 5$ 2. $y := 10$ 3. $z := x + y$ 4. $t1 := z - 2$ 5. $x := t1 + y$ 6. if $x < y$ goto 7 7. $t2 := x * y$ 8. $y := 15$ 9. $z := z + y$ 10. $w := x - y$ 11. if $t1 = 0$ goto 17 12. $w := x + y$ 13. $t3 := y - z$ 14. $z := w - t3$ 15. if $z < w$ goto 3 16. $z := x + y$ 17. output z 18. output w 19. $x := 10$ 20. $y := 15$ 21. $a := x * y$ 22. $t1 := a + 3$ 23. $x := t1 + y$ 24. if $x < y$ goto 25 25. $t2 := x + y$ 26. $y := 15$ 27. $a := a + y$ 28. $b := x - y$ 29. if $t1 = 0$ goto 35 30. $b := x * y$ 31. $t3 := y - z$ 32. $a := b - t2$ 33. if $b < b$ goto 21 34. $a := x + y$ 35. output a 36. output b		
		a) Identify the lines of code that serve as leader instructions according to leader selection rule 2. b) Identify the lines of code that serve as leader instructions according to leader selection rule 3. c) Identify the lines which are selected as leader instruction according to both selection rule 2 and 3. d) Draw the control flow graph (CFG) for the given three-address code. e) Explain how the Constant Propagation optimization technique could be implemented on this code, mentioning the lines where this optimization can be applied.		