



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Examination, Spring - 2025

Course Code: CSE331, Course Title: Compiler Design

Level: 4 Term: 1 Batch: 61

Time: 02:00 Hrs.

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.	a)	Apply left factoring technique in the following grammar. domain $\rightarrow$ web website webapp diu.bd edu.bd diu.edu edu.ac	[3]	CO																						
	b)	Consider the following grammar to produce LR (0) parser and Canonical Table from the following grammar. $A \rightarrow AxyB \mid xC$ $B \rightarrow Cbxy \mid a$ $C \rightarrow CbC \mid y$ $D \rightarrow a \mid m$	[7]																							
2.	a)	State the rules of the FIRST () and FOLLOW () functions.	[3]	CO																						
	b)	Construct a predictive parsing table from the following grammar using LL (1) parser. <table><tr><th>Productions</th><th>FIRST ()</th><th>FOLLOW ()</th></tr><tr><td>Expense $\rightarrow$ Tax Salary</td><td></td><td></td></tr><tr><td>Salary $\rightarrow$ Grocery Tax Salary $\mid \mid \epsilon$</td><td></td><td></td></tr><tr><td>Grocery $\rightarrow$ + - ϵ</td><td></td><td></td></tr><tr><td>Tax $\rightarrow$ Factor Benefit</td><td></td><td></td></tr><tr><td>Benefit $\rightarrow$ Cost Factor Benefit $\mid \mid \epsilon$</td><td></td><td></td></tr><tr><td>Cost $\rightarrow$ *</td><td></td><td></td></tr><tr><td>Factor $\rightarrow$ (Expense) num</td><td></td><td></td></tr></table>	Productions		FIRST ()	FOLLOW ()	Expense $\rightarrow$ Tax Salary			Salary $\rightarrow$ Grocery Tax Salary $\mid \mid \epsilon$			Grocery $\rightarrow$ + - ϵ			Tax $\rightarrow$ Factor Benefit			Benefit $\rightarrow$ Cost Factor Benefit $\mid \mid \epsilon$			Cost $\rightarrow$ *			Factor $\rightarrow$ (Expense) num	
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3.	a)	Consider the following expression: $x+x*(y-z)+(y-z)*p+q-x+z$ Write the Three Address code, Quadruples, Indirect Triples and draw the DAG for the above expression.	[6]	CO3																						
	b)	Describe the following Code Optimization techniques with proper example. i. Copy Propagation and ii. Strength Reduction	[4]																							

4.	a) Consider the following Instructions and answer the following questions: 1. $i = a + 5$ 2. $j = b - 3$ 3. $t1 = 2 * i$ 4. $k = t1 + j$ 5. if $i > j$ goto (3) 6. $v = c[t1]$ 7. $i = i + 1$ 8. $t2 = 3 * i$ 9. $x = y + 4$ 10. $t3 = x * 2$ 11. $z = t3 - j$ 12. $a[t12] = t14$ goto (9) 13. $q = d[t2]$ 14. $j = j - 1$ 15. $t4 = 5 * j$ 16. $p = r + t4$ 17. $w = e[j]$ 18. $m = p * 3$ 19. $w = e[j]$ goto (16) 20. $a = t5 / 2$ 21. $t5 = 6 * m$ 22. $b = n + t6$ 23. $t6 = t4 + 2$ 24. $y = a + 3$ 25. $j = j - 1$ goto (22) 26. goto (6) 27. $y = o[t9]$ 28. $z = x - t6$ 29. $n = t3 + t8$ 30. $t8 = 8 * x$ 31. 32. $t9 = 4 * y$ 33. goto (28) 34. $t10 = 9 * z$ 35. $l = m + t10$ 36. $o = q[t8]$ 37. $t8 = 8 * x$ 38. $z = x - t6$ 39. $t2 = 3 * l$ goto (31) i. Which lines in the code qualify as leaders by leader selection rule 2? ii. Is / Are there any instruction(s) designated as leaders more than twice? iii. What is the total number of basic blocks identified in the code?	[6]
b)	Draw the flow graph for the above mentioned instructions.	[4]

CO3