



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

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