



# 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 border="1"><thead><tr><th>Productions</th><th>FIRST ()</th><th>FOLLOW ()</th></tr></thead><tbody><tr><td>Expense <math>\rightarrow</math> Tax Salary</td><td></td><td></td></tr><tr><td>Salary <math>\rightarrow</math> Grocery Tax Salary   /   <math>\epsilon</math></td><td></td><td></td></tr><tr><td>Grocery <math>\rightarrow</math> +   -   <math>\epsilon</math></td><td></td><td></td></tr><tr><td>Tax <math>\rightarrow</math> Factor Benefit</td><td></td><td></td></tr><tr><td>Benefit <math>\rightarrow</math> Cost Factor Benefit   /   <math>\epsilon</math></td><td></td><td></td></tr><tr><td>Cost <math>\rightarrow</math> *</td><td></td><td></td></tr><tr><td>Factor <math>\rightarrow</math> (Expense)   num</td><td></td><td></td></tr></tbody></table>	Productions		FIRST ()	FOLLOW ()	Expense $\rightarrow$ Tax Salary			Salary $\rightarrow$ Grocery Tax Salary   /   $\epsilon$			Grocery $\rightarrow$ +   -   $\epsilon$			Tax $\rightarrow$ Factor Benefit			Benefit $\rightarrow$ Cost Factor Benefit   /   $\epsilon$			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.	<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. <math>i = a + 5</math></p> <p>2. <math>j = b - 3</math></p> <p>3. <math>t1 = 2 * i</math></p> <p>4. <math>k = t1 + j</math></p> <p>5. if <math>i &gt; j</math> goto (3)</p> <p>6. <math>v = c[t1]</math></p> <p>7. <math>i = i + 1</math></p> <p>8. <math>t2 = 3 * i</math></p> <p>9. <math>x = y + 4</math></p> <p>10. <math>t3 = x * 2</math></p> <p>11. <math>z = t3 - j</math></p> <p>12. <math>a[t12] = t14</math> goto (9)</p> <p>13. <math>q = d[t2]</math></p> </div> <div style="width: 30%;"> <p>14. <math>j = j - 1</math></p> <p>15. <math>t4 = 5 * j</math></p> <p>16. <math>p = r + t4</math></p> <p>17. <math>w = e[j]</math></p> <p>18. <math>m = p * 3</math></p> <p>19. <math>w = e[j]</math> goto (16)</p> <p>20. <math>a = t5 / 2</math></p> <p>21. <math>t5 = 6 * m</math></p> <p>22. <math>b = n + t6</math></p> <p>23. <math>t6 = t4 + 2</math></p> <p>24. <math>y = a + 3</math></p> <p>25. <math>j = j - 1</math> goto (22)</p> <p>26. goto (6)</p> </div> <div style="width: 30%;"> <p>27. <math>y = o[t9]</math></p> <p>28. <math>z = x - t6</math></p> <p>29. <math>n = t3 + t8</math></p> <p>30. <math>t8 = 8 * x</math></p> <p>31.</p> <p>32. <math>t9 = 4 * y</math></p> <p>33. goto (28)</p> <p>34. <math>t10 = 9 * z</math></p> <p>35. <math>l = m + t10</math></p> <p>36. <math>o = q[t8]</math></p> <p>37. <math>t8 = 8 * x</math></p> <p>38. <math>z = x - t6</math></p> <p>39. <math>t2 = 3 * l</math> 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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