


	Reg. No.:	
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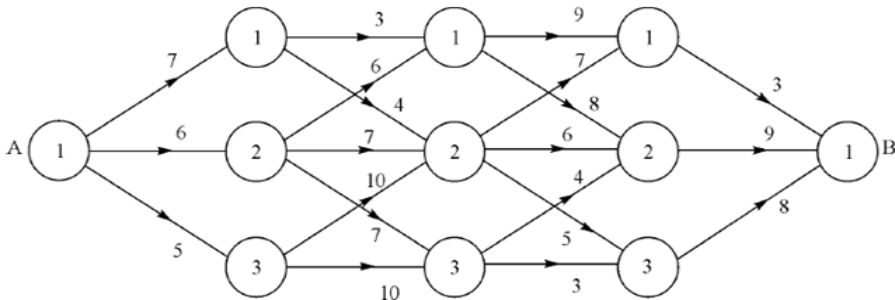


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Mid-Term Examinations – August 2021			
Programme	: B.Tech. [BCE]	Semester	: Interim 2021-22
Course	: Operation Research	Code	: MAT2004
Faculty	: Dr. Ajay Kumar Bhurjee	Slot/ Class No.	: C11 / 0184
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Question Description	Marks																				
1	<p>A manufacturer can produce three different products A, B, and C during a given time period. Each of these products requires four different manufacturing operations: Grinding, Turning, Assembly and Testing. The manufacturing requirements in hours per unit of the product are given below for A, B, and C:</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <th></th> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td>Grinding</td> <td>1</td> <td>2</td> <td>1</td> </tr> <tr> <td>Turning</td> <td>3</td> <td>1</td> <td>4</td> </tr> <tr> <td>Assembly</td> <td>6</td> <td>3</td> <td>4</td> </tr> <tr> <td>Testing</td> <td>5</td> <td>4</td> <td>6</td> </tr> </table> <p>The available capacities of these operations in hours for the given time period are as follows: Grinding 30 hours, Turning: 60 hours, Assembly: 200 hours and Testing: 200 hours. The contribution of overheads and profit is Rs.4/- for each unit of A, Rs.6/- for each unit of B and Rs.5/- for each unit of C. The firm can sell all that it produces. Determine the optimum amount of A, B, and C to produce during the given time period for maximizing the returns.</p>		A	B	C	Grinding	1	2	1	Turning	3	1	4	Assembly	6	3	4	Testing	5	4	6	10
	A	B	C																			
Grinding	1	2	1																			
Turning	3	1	4																			
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2	<p>A company manufactures two products X and Y on three machines Turning, Milling and finishing machines. Each unit of X takes, 10 hours of turning machine capacity, 5 hours of milling machine capacity and 1 hour of finishing machine capacity. One unit of Y takes 6 hours of turning machine capacity, 10 hours of milling machine capacity and 2 hours of finishing machine capacity. The company has 2500 hours of turning machine capacity, 2000 hours of milling machine capacity and 500 hours of finishing machine capacity in the coming planning period. The profit contribution of product X and Y are Rs. 23 per unit and Rs. 32 per unit respectively. Formulate the linear programming problem and find the solution of the problem by solving its dual problem.</p>	10																				
3	<p>Solve the following integer programming problem:</p> <p style="margin-left: 40px;">Maximize $Z = x_1 + x_2$ subject to $3x_1 + 2x_2 \leq 12,$ $x_2 \leq 2, x_1, x_2 \geq 0, \text{ and integers.}$</p>	10																				

4	<p>A department store wishes to purchase 7500 purses of which 2500 are of style X, 2500 are of style Y and 2500 are of style Z. Four manufacturers A, B, C and D bid to supply not more than the following quantities, all styles combined. A = 1000, B = 3000, C = 2100 and D = 1900. The following table gives the cost per purse of each style of the bidders in Rs. per purse.</p> <table border="1"> <tr> <th>Style↓</th><th>A</th><th>B</th><th>C</th><th>D</th></tr> <tr> <td>X</td><td>10</td><td>4</td><td>9</td><td>5</td></tr> <tr> <td>Y</td><td>6</td><td>7</td><td>8</td><td>7</td></tr> <tr> <td>Z</td><td>3</td><td>8</td><td>6</td><td>9</td></tr> </table> <p>How should orders to be placed by the department store to minimize the total cost?</p>	Style↓	A	B	C	D	X	10	4	9	5	Y	6	7	8	7	Z	3	8	6	9	10
Style↓	A	B	C	D																		
X	10	4	9	5																		
Y	6	7	8	7																		
Z	3	8	6	9																		
5	<p>The following figure shows the route map of various branch offices of a company. The marketing executive of the company should like to start from head office at A and reach the branch office at B by traveling shortest path and visiting as many as branch offices. Help him to plan his journey by using dynamic programming technique.</p> 	10																				

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