



**NAVACHANA
UNIVERSITY**

a UGC recognized University

School: School of Engineering and Technology
Program/s: BSc Data Science
Year: 2nd **Semester:** 3rd
Examination: End Semester Examination
Examination year: December - 2021

Course Code: DS206 **Course Name:** Operation Research
Date: 08/12/2021
Time: 08:30 am to 10:30 am

Total Marks: 40
Total Pages: 2

Instructions:

- Write each answer on a new page.
- Use of a calculator is permitted.

Q. No.	Details	Marks	CO's	BTL																														
Q.1	Attempt ANY TWO of the following:		CO2, CO3, CO4	1,2,3,4																														
[a]	Obtain all basic solution of the following system of linear equations. Also identify basic solutions are feasible/non feasible. $x_1 + 2x_2 + x_3 = 4$, $2x_1 + x_2 + 5x_3 = 5$.	6																																
[b]	Using graphical method find the minimum value of $Z = -x_1 + 2x_2$, subject to $-x_1 + 3x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$ & $x_1, x_2 \geq 0$.	6																																
[c]	Four different jobs can be done on four different machines. Using Hungarian method find how should the jobs be assigned to the various machines so that the total cost is minimized?	6																																
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="4">Machines</th> </tr> <tr> <th></th> <th>M_1</th> <th>M_2</th> <th>M_3</th> <th>M_4</th> </tr> </thead> <tbody> <tr> <th>J_1</th> <td>2</td> <td>10</td> <td>9</td> <td>7</td> </tr> <tr> <th>J_2</th> <td>15</td> <td>4</td> <td>14</td> <td>8</td> </tr> <tr> <th>J_3</th> <td>13</td> <td>14</td> <td>16</td> <td>11</td> </tr> <tr> <th>J_4</th> <td>4</td> <td>15</td> <td>13</td> <td>9</td> </tr> </tbody> </table>		Machines					M_1	M_2	M_3	M_4	J_1	2	10	9	7	J_2	15	4	14	8	J_3	13	14	16	11	J_4	4	15	13	9			
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Q.3	Use simplex method to solve the following problem: $Max Z = 2x_1 + 5x_2$, Subject to $x_1 + 4x_2 \leq 24$, $3x_1 + x_2 \leq 21$, $x_1 + x_2 \leq 9$ & $x_1, x_2 \geq 0$.	8	CO2	1,2,3,4																														
Q.4	Use Big M method to solve following problem: $Max Z = 6x_1 + 4x_2$	10	CO2	1,2,3,4																														

	Subject to $2x_1 + 3x_2 \leq 30, 3x_1 + 2x_2 \leq 24, x_1 + x_2 \geq 3$ & $x_1, x_2 \geq 0$.																																					
Q.5	Attempt ANY TWO of the following:		CO1, CO3, CO4	1,2,3,4																																		
[a]	Use vogel's approximation method to find the initial basic feasible solution to the following transportation problem:	5																																				
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[b]	Determine an initial basic feasible solution to the following transportation problem using north-west corner rule:	5																																				
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[c]	Explain various applications of operation research in detail.	5																																				

*****End of Question Paper*****