JHARKHAND Rai University
RANCHI

End Semester/Reappear (Semester VII) Examination December, 2024

Programme:B.Tech (MiE)

Course: Operation Research in Mining **Full Marks: 70**

Course Code: 8PCCMiE402 **Time: 3 Hrs.**

Enrolment no. _____

<table>
<tr><th>Q.No.</th><th>Questions</th><th>CO</th><th>Bloom Taxonomy Category</th><th>Marks</th></tr>
<tr><td colspan="5">Section I</td></tr>
<tr><td>1</td><td>Short Answer type questions.</td><td></td><td></td><td rowspan="11">4 x 5 = 20</td></tr>
<tr><td rowspan="3">a</td><td>Express the given primal problem in dual:
Minimization Z = 2X1 + 5X3
Subject to:
X1 + X2 ≥ 2; 2X1 + X2 + 6X3 ≤ 6; X1 – X2 + 3X3 = 4 and X1, X2, X3 ≥ 0</td><td>CO1</td><td>Understand</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Determine the basic feasible solution of given linear programming problem:
Minimize Z = X1 – 3X2 + 2X3
Subject to:
3X1 – X2 + 2X3 ≤ 7; – 2X1 + 4X2≤ 12; -4X1 + 3X2 + 8X3 ≤ 10 and X1, X2, X3 ≥ 0</td><td>CO1</td><td>Understand</td></tr>
<tr><td rowspan="3">b</td><td>Express the mathematical form of transportation problem.</td><td>CO2</td><td>Remember</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Express the mathematical form of assignment problem.</td><td>CO2</td><td>Remember</td></tr>
<tr><td rowspan="3">c</td><td>Define optimistic time, pessimistic time and most likely time.</td><td>CO3</td><td>Remember</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>What is the different phase in project management?</td><td>CO3</td><td>Remember</td></tr>
<tr><td rowspan="3">d</td><td>Define zero – sum game, two – person zero – sum game, and nonzero – sum game.</td><td>CO4</td><td>Remember</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Define strategy, pure strategy, and mixed strategy in game theory.</td><td>CO4</td><td>Remember</td></tr>
<tr><td colspan="5">Section II</td></tr>
<tr><td colspan="2">Long Answer type questions.</td><td></td><td></td><td rowspan="5"></td></tr>
<tr><td rowspan="3">2</td><td>Find the initial solution to the following Transportation Problem using Vogel’s Approximation Method (VAM)
<table>
<tr><td colspan="7">Destination</td></tr>
<tr><td rowspan="5">Factory</td><td></td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>Supply</td></tr>
<tr><td>F_1</td><td>3</td><td>3</td><td>42</td><td>1</td><td>100</td></tr>
<tr><td>F_2</td><td>12</td><td>2</td><td>4</td><td>24</td><td>125</td></tr>
<tr><td>F_3</td><td>1</td><td>52</td><td>3</td><td>21</td><td>75</td></tr>
<tr><td>Demand</td><td>120</td><td>80</td><td>75</td><td>25</td><td>300</td></tr>
</table></td><td>CO2</td><td>Understand</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Five wagons are available at stations 1, 2, 3, 4 and 5. These are required at five stations I, II, III, IV and V. The mileages between various stations are given by the table below. How should the wagons be transported so as to minimize the total mileage covered?
<table>
<tr><td></td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td></tr>
<tr><td>1</td><td>25</td><td>5</td><td>9</td><td>18</td><td>7</td></tr>
<tr><td>2</td><td>13</td><td>9</td><td>6</td><td>4</td><td>14</td></tr>
<tr><td>3</td><td>3</td><td>2</td><td>4</td><td>4</td><td>5</td></tr>
<tr><td>4</td><td>21</td><td>9</td><td>24</td><td>17</td><td>15</td></tr>
<tr><td>5</td><td>11</td><td>3</td><td>14</td><td>19</td><td>10</td></tr>
</table></td><td>CO2</td><td>Understand</td></tr>
</table>

3	Draw a network to represent the project and the minimum time of completion of the project when time, in days of each task is as follows: Activity: 1 – 2 | 1 – 3 | 2 – 3 | 2 – 5 | 3 – 4 | 3 – 6 | 4 – 5 | 4 – 6 | 5 – 6 | 6 – 7 Duration (days): 15 | 15 | 3 | 5 | 8 | 12 | 1 | 14 | 3 | 14	CO3	Analyze	**3 x 10 = 30**
	or			
	Write rules for network construction. Consider table summarizing the details of a project involving 14 activities. Activity: A | B | C | D | E | F | G | H | I | J | K | L | M | N Predecessor: - | - | - | B | A | A | B | C,D | C,D | E | F,G,H | F,G,H | I | J,K Duration: 2 | 6 | 4 | 3 | 6 | 8 | 3 | 7 | 2 | 5 | 4 | 3 | 13 | 7	CO3	Analyze	
4	Discuss principle of dominance. Players A and B play a game in which each player has three coins (20p, 25p, 50p). Each of them selects a coin without the knowledge of the other person. If the sum of the value of the coins is an even number, A win B's coin. If that sum is an odd number, B win A's coin. Develop a pay off matrix with respect to player A. Find the optimal strategies for the players.	CO4	Apply	
	or			
	Solve the given 2 X N game by the method of sub games Player A: 7, 9, 11 / 3, 5, 3 (Player B)	CO4	Analyze	
	Section III			
	Application based questions			
5	The following table shows the jobs of a network along with their time estimates. The time estimates an in day: Job: 1 – 2 | 1 – 6 | 2 – 3 | 2 – 4 | 3 – 5 | 4 – 5 | 5 – 8 | 6 – 7 | 7 – 8 a: 3 | 2 | 6 | 2 | 5 | 3 | 1 | 3 | 4 m: 6 | 5 | 12 | 5 | 11 | 6 | 4 | 9 | 19 b: 15 | 14 | 30 | 8 | 17 | 15 | 7 | 27 | 38 (a) Draw the project network. (b) Find the critical path. (c) Find the probability that the project is completed in 31 days.	CO3	Analyze	**1 x 20 = 20**
	or			
	For the given activities determine: Job: 1 – 2 | 1 – 3 | 2 – 4 | 3 – 4 | 3 – 5 | 2 – 6 | 4 – 6 | 5– 6 a: 6 | 3 | 2 | 4 | 1 | 5 | 7 | 1 m: 9 | 4 | 5 | 6 | 1.5 | 6 | 8 | 2 b: 12 | 11 | 14 | 8 | 5 | 7 | 15 | 3 (a) Critical path using PERT (b) Calculate variance and standard deviation for each activity. (c) Calculate the probability of completing the project in 26 days.	CO3	Apply	

Course Outcome:

On the completion of the Course, the students will be able to:

CO1 Formulate real-world problems as a linear programming model and describe the theoretical workings of the graphical and simplex method.

CO2 Formulate specialized linear programming problems, namely transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems.

CO3 To develop the abilities in project evaluation techniques like PERT, CPM etc.

CO4 Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.