Course Code: 23MB3C02

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE(AUTONOMOUS)

I –MBAIII-Semester Model Paper (BR23), January - 2024

SUBJECT NAME: OPERATIONS RESEARCHBRANCH:MBA

Time: 3 hours Max. Marks: 70

PART - A Answer ONE Question from each UNIT (5 x 12 = 60 Marks)
All Questions Carry Equal Marks
PART - B Compulsory (1 x 10 = 10 Marks)

PART -A

<table>
<tr><th colspan="2">UNIT-I</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>1.a)</td><td>What are the advantages of operation research?</td><td>6M</td><td>CO1</td><td>L1</td></tr>
<tr><td>b)</td><td>Solve the following LPP using Graphical Method
Objective function Min Z=$20x + 10y$
Subject to the constraints $x + 2y \leq 40, 3x + y \geq 30, 4x + 3y \geq 60,$
Non negative conditions x,y≥0.</td><td>6M</td><td>CO1</td><td>L3</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>2.a)</td><td>Solve the following LPP using Big-M method
Minimise $Z = 600x_1 + 500x_2$
Subject to constraints $2x_1 + x_2 \geq 80, x_1 + 2x_2 \geq 60$ $and\ x_{1,}x_2 \geq 0.$</td><td>12M</td><td>CO1</td><td>L3</td></tr>
</table>

<table>
<tr><th colspan="2">UNIT-II</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>3.a)</td><td>Solve the following Transportation problem
<table>
<tr><th></th><th>W_1</th><th>W_2</th><th>W_3</th><th>W_4</th><th>Availability</th></tr>
<tr><td>F_1</td><td>19</td><td>30</td><td>50</td><td>10</td><td>7</td></tr>
<tr><td>F_2</td><td>70</td><td>30</td><td>40</td><td>60</td><td>9</td></tr>
<tr><td>F_3</td><td>40</td><td>8</td><td>70</td><td>20</td><td>18</td></tr>
<tr><td>Requirement</td><td>5</td><td>8</td><td>7</td><td>14</td><td></td></tr>
</table>
</td><td>12M</td><td>CO2</td><td>L3</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>4.a)</td><td>Explain Hungarian method of assignment problem?</td><td>6M</td><td>CO2</td><td>L4</td></tr>
<tr><td>b)</td><td>Solve the travelling salesman problem given in the matrix from as shown below.
<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td>A</td><td>∞</td><td>46</td><td>16</td><td>40</td></tr>
<tr><td>B</td><td>41</td><td>∞</td><td>50</td><td>40</td></tr>
<tr><td>C</td><td>82</td><td>32</td><td>∞</td><td>60</td></tr>
<tr><td>D</td><td>40</td><td>40</td><td>36</td><td>∞</td></tr>
</table>
</td><td>6M</td><td>CO2</td><td>L3</td></tr>
</table>

<table>
<tr><th colspan="2">UNIT-III</th><th>Marks</th><th>CO</th><th>BL</th></tr>
</table>

<table>
<tr><td>5.a)</td><td>What are the features of dynamic programming problem and explain it?</td><td>6M</td><td>CO3</td><td>L1</td></tr>
<tr><td>b)</td><td>Use dynamic programming to solve the LPP
Maximize $Z = x_1 + 9x_2$
Subject to the constraints $2x_1 + x_2 \leq 25$, $x_2 \leq 11$, $x_1, x_2 \geq 0$.</td><td>6M</td><td>CO3</td><td>L4</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>6.a)</td><td>Use Branch and bound technique to solve the following
Maximize $Z = x_1 + 4x_2$
Subject to the constraints $2x_1 + 4x_2 \leq 7$, $5x_1 + 3x_2 \leq 15$, $x_1, x_2 \geq 0$ and are integers.</td><td>12M</td><td>CO3</td><td>L3</td></tr>
</table>

<table>
<tr><th colspan="2">UNIT-IV</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>7.a)</td><td>Define strategy? Explain the different types of strategy?</td><td>6M</td><td>CO4</td><td>L1</td></tr>
<tr><td>b)</td><td>Is the following two-person zero-sum game stable? Solve the game
$$\begin{array}{cc} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 5 & -10 & 9 & 0 \\ 6 & 7 & 8 & 1 \\ 8 & 7 & 15 & 1 \\ 3 & 4 & -1 & 4 \end{bmatrix} \end{array}$$</td><td>6M</td><td>CO4</td><td>L4</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>8.a)</td><td>Explain Monte-Carlo simulation?</td><td>6M</td><td>CO4</td><td>L4</td></tr>
<tr><td>b)</td><td>A manufacturing company keeps stock of a special product. Previous experience indicates the daily demand as given below.
<table>
<tr><td>Daily Demand</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr>
<tr><td>Probability</td><td>0.01</td><td>0.20</td><td>0.15</td><td>0.50</td><td>0.12</td><td>0.02</td></tr>
</table>
Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day.
Random numbers: 25,39,65,76,12,05,73,89,19,49.</td><td>6M</td><td>CO4</td><td>L3</td></tr>
</table>

<table>
<tr><th colspan="2">UNIT-V</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>9.a)</td><td>Define replacement. Explain the different types of replacement policy with example?</td><td>6M</td><td>CO5</td><td>L1</td></tr>
<tr><td>b)</td><td>What are the difference between PERT and CPM?</td><td>6M</td><td>CO5</td><td>L1</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>10.a)</td><td>Consider the following data for activities in a given project.
<table>
<tr><td>Activity</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td></tr>
<tr><td>Predecessor</td><td>-</td><td>A</td><td>A</td><td>B</td><td>B</td><td>D,E</td><td>D</td><td>C,F,G</td></tr>
<tr><td>Time(days)</td><td>2</td><td>4</td><td>8</td><td>3</td><td>2</td><td>3</td><td>4</td><td>8</td></tr>
</table>
Draw an arrow diagram for the project, compute the earliest and the latest event times. What is the minimum project completion time? List the activities on the critical path.</td><td>12M</td><td>CO5</td><td>L3</td></tr>
</table>

PART – B

<table>
<tr><th colspan="2">CASE STUDY</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>11</td><td>From the data given below construct the network and number the notes using Fulkerson’s rule. Calculate the expected task time and their variance. Carrying out the forward pass computation and backward pass computation, find TE and Tl for all nodes.
<table>
<tr><td>Task</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td><td>K</td></tr>
<tr><td>Least time</td><td>4</td><td>5</td><td>8</td><td>2</td><td>4</td><td>6</td><td>8</td><td>5</td><td>3</td><td>5</td><td>6</td></tr>
<tr><td>Most likely time</td><td>5</td><td>7</td><td>11</td><td>3</td><td>7</td><td>9</td><td>12</td><td>6</td><td>5</td><td>8</td><td>9</td></tr>
<tr><td>Maximum time</td><td>8</td><td>10</td><td>12</td><td>7</td><td>10</td><td>15</td><td>16</td><td>9</td><td>7</td><td>11</td><td>13</td></tr>
</table>
Precedence relationship: A,C,D can start simultaneously E>B,C : F,G>D: H,I>E,F: J>I,G: K>H :B>A.
Also determine i) Critical path ii) Probability of completing the project in 40 days.</td><td>10M</td><td>CO5</td><td>L4</td></tr>
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