| Roll No. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# PRESIDENCY UNIVERSITY

## BENGALURU

**End - Term Examinations – December 2025**

**Date:** 23-12-2025 **Time:** 09:30am – 12:30pm

| **School:** SOM-PG | **Program:** MBA | |
|---|---|---|
| **Course Code :** MBA3091 | **Course Name:** Operations Analytics | |
| **Semester**: III | **Max Marks**: 100 | **Weightage**: 50% |

| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
|---|---|---|---|---|---|
| **Marks** | **31** | **31** | **19** | **19** | |

**Instructions:**

*(i) Read all questions carefully and answer accordingly.*

*(ii) Do not write anything on the question paper other than roll number.*

## Part A

**Answer ALL the Questions. Each question carries 3marks.** **10Q x 3M=30M**

| | | | | |
|---|---|---|---|---|
| **1.** | A manufacturing firm prepares an LPP to maximise profit and finds a production plan that satisfies all constraints while giving the best possible return. Identify the type of solution represented by this production plan. | **3 Marks** | **L2** | **CO1** |
| **2.** | During a resource-planning exercise, a company observes that some available machine hours are not fully utilised in a certain constraint. Recognise and define the term and used for the unused portion of such a resource. | **3 Marks** | **L2** | **CO1** |
| **3.** | A distribution network must move goods from multiple warehouses to several retail centres at minimum cost. Describe the type of mathematical model that represents this situation. | **3 Marks** | **L2** | **CO2** |
| **4.** | After a firm obtains the best production plan from an LPP, the manager studies how changes in resource availability or profit margins would affect the final solution. Identify and explain the importance of the analytical process being carried out. | **3 Marks** | **L2** | **CO2** |

| | | | | |
|---|---|---|---|---|
| **5.** | An operations manager wants to allocate workers to specific tasks so that total cost or time is minimised, with each worker assigned to only one task. Define the type of optimisation model that fits this scenario. | **3 Marks** | **L2** | **CO3** |
| **6.** | Two competing companies analyse a payoff table and find a value that is simultaneously the minimum in its row and the maximum in its column. Explain the significance of the special point represented by this value in game theory. | **3 Marks** | **L2** | **CO3** |
| **7.** | A firm participates in a competitive game where it commits to selecting the same action every time without involving probabilities. Recognise the term used for this form of strategic choice and mention its characteristics. | **3 Marks** | **L2** | **CO3** |
| **8.** | A business leader evaluates several possible business moves while considering different future market conditions. Identify the names given to the set of available decisions and the set of possible future environments. | **3 Marks** | **L2** | **CO4** |
| **9.** | Two rival companies list the profits and losses corresponding to each combination of their competing strategies. List the type of table they are constructing in this competitive framework and mention the characteristics of the table. | **3 Marks** | **L2** | **CO4** |
| **10.** | An investor compares alternative projects where the probabilities of different market outcomes are known. Explain the decision-making environment represented in this situation. | **3 Marks** | **L2** | **CO4** |

## Part B

**Answer the Questions.** **Total Marks 40M**

| | | | | | |
|---|---|---|---|---|---|
| **11.** | **a.** | A firm manufactures two products A and B on which the profits earned per unit are Rs.5 and Rs.10 respectively. Each product is processed on two machines L and P. Product A requires one minute of processing time on L and two minutes on P. Product B requires one minute each on L and P. Machine L is available for not more than 9 hours 30 minutes while P is available for 15 hours during any working day. Formulate this as an LPP to find the number of units of products A and B to be manufactured in order maximise the profit. | **10 Marks** | **L4** | **CO1** |
| | | **Or** | | | |
| **12.** | **a.** | Solve and interpret the solution to the following LP problem graphically.<br>Min $Z = 20X_1 + 10X_2$<br>subject to $X_1 + 2X_2 \leq 40$<br>$3X_1 + 1X_2 \geq 30$<br>$4X_1 + 3X_2 \geq 60$<br>and $X_1, X_2 \geq 0$ | **10 Marks** | **L4** | **CO1** |

<table>
<tr><td>13.</td><td>a.</td><td>Determine the initial basic feasible solution using Vogel's approximation method for the following transportation problem. Interpret the result<br><table><tr><td></td><td colspan="6">Destination</td></tr><tr><td rowspan="5">source</td><td></td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>Supply</td></tr><tr><td>S1</td><td>19</td><td>30</td><td>50</td><td>10</td><td>7</td></tr><tr><td>S2</td><td>70</td><td>30</td><td>40</td><td>60</td><td>9</td></tr><tr><td>S3</td><td>40</td><td>8</td><td>70</td><td>20</td><td>18</td></tr><tr><td>Demand</td><td>5</td><td>8</td><td>7</td><td>14</td><td>34</td></tr></table></td><td>10 Marks</td><td>L4</td><td>CO2</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>14.</td><td>a.</td><td>Examine the methods used to handle degeneracy in a transportation problem.</td><td>10 Marks</td><td>L4</td><td>CO2</td></tr>
<tr><td>15.</td><td>a.</td><td>An automobile dealer wishes to put four repair people to four different jobs. The repair people have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of person-hours that would be required for each job-man combination. This is given in matrix form in the following table:<br><table><tr><td></td><td colspan="5">Jobs</td></tr><tr><td rowspan="5">Persons</td><td></td><td>I</td><td>II</td><td>III</td><td>IV</td></tr><tr><td>A</td><td>5</td><td>3</td><td>2</td><td>8</td></tr><tr><td>B</td><td>7</td><td>9</td><td>2</td><td>6</td></tr><tr><td>C</td><td>6</td><td>4</td><td>5</td><td>7</td></tr><tr><td>D</td><td>5</td><td>7</td><td>7</td><td>8</td></tr></table>Find the optimal assignment that will result in minimum person hours needed. Examine the allocations made.</td><td>10 Marks</td><td>L4</td><td>CO3</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>16.</td><td>a.</td><td>A marketing team offers a two-coin bonus: the matching player receives Rs 5 if both coins are heads and Re 0 if both are tails. The non-matching player receives Rs 3 when the two coins do not match. Given the choice of being a matching or non-matching player, which one would you choose and what would be your strategy? Analyse the strategy adopted.</td><td>10 Marks</td><td>L4</td><td>CO3</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| **17.** | **a.** | Mr Sethi has Rs 10,000 to invest in one of three options: A, B or C. The return on his investment depends on whether the economy experiences inflation, recession, or no change at all. The possible returns under each economic condition are given below:<br><br>Strategy<br>States of nature: Inflation — A: 2000, B: 3000, C: 2500<br>Recession — A: 1200, B: 800, C: 1000<br>No change — A: 1500, B: 1000, C: 1800<br><br>Select a strategy using each of the following decision criteria: (i) Maximin criterion (ii) Maximax criterion Analyze the decisions made. | **10 Marks** | **L4** | **CO4** |
| | | **Or** | | | |
| **18.** | **a.** | A retailer purchases cherry every morning at Rs 50 a case and sells them for Rs 80 a case. Any case that remains unsold at the end of the day can be disposed of the next day at a salvage value of Rs 20 per case (thereafter they have no value). Past sales have ranged from 14 to 17 cases per day. The daily demand for the number of cases sold is as given below.<br><br>Cases sold: 14 15 16 17<br>probability: 0.1 0.2 0.4 0.3<br>Find out how many cases should the retailer purchase per day in order to maximize his profit. Examine the decision made. | **10 Marks** | **L4** | **CO4** |

## Part C

**Answer all the Questions. Each question carries 15marks** **2Q x 15M=30M**

| | | | | | |
|---|---|---|---|---|---|
| **19.** | **a.** | A television company has three major departments for manufacturing two of its models – A and B. The daily capacities of the departments are given as follows:<br><br>Per Unit Time<br>Requirement (hours) Hours Available<br>Model A Model B daily<br>Department I 3 2 16<br>Department II 2 1 12<br>Department III 3 1 16<br><br>The marginal profit per unit from model A is Rs 400 and from model B is Rs 100. Assuming that the company can sell any quantity of either product due to favourable market conditions, determine the optimum output for both the models, the highest possible profit for this month using simplex method. Examine the optimum allocation. | **15 Marks** | **L4** | **CO1** |

<table>
<tr>
<td>20.</td>
<td>a.</td>
<td>A company has three factories at Amethi, Baghpat and Gwalior that have a production capacity of 5,000, 6,000, and 2,500 tonnes, respectively. Four distribution centres at Allahabad, Bombay, Kolkata and Delhi, require 6,000 tonnes, 4,000 tonnes, 2,000 tonnes and 1,500 tonnes, respectively, of the product. The transportation costs per tonne from different factories to different centres are given below:
<table>
<tr><td rowspan="2">Factories</td><td colspan="4">Distribution Centres</td></tr>
<tr><td>Allahabad</td><td>Bombay</td><td>Kolkata</td><td>Delhi</td></tr>
<tr><td>Amethi</td><td>3</td><td>2</td><td>7</td><td>6</td></tr>
<tr><td>Baghpat</td><td>7</td><td>5</td><td>2</td><td>3</td></tr>
<tr><td>Gwalior</td><td>2</td><td>5</td><td>4</td><td>5</td></tr>
</table>
Suggest an optimum transportation schedule and find the minimum cost of transportation. Examine the optimum allocation made.</td>
<td>15 Marks</td>
<td>L4</td>
<td>CO2</td>
</tr>
</table>