

|                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----|--------------------------|----|--|---|----|-----|----|---|---|----|---|----|---|---|---|---|---|---|----|---|---|---|---|---|---|---|---|----|----|----|----|----|
| <b>QP Code: D143768</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Total Pages: 2</b> |     | <b>Name:</b>             |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
|                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     | <b>Register No.</b>      |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>FOURTH SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2026</b>                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>MANAGEMENT STUDIES</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>BBA4CJ205 DECISION SCIENCE</b>                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>2024 Admission onwards</b>                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>Maximum Time :2 Hours</b>                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     | <b>Maximum Marks :70</b> |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>Section A</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 1                                                                                       | Define operations research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 2                                                                                       | What do you mean by Game Theory?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 3                                                                                       | What is the MODI Method?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 4                                                                                       | Define CPM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 5                                                                                       | Why is ethics important in OR?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 6                                                                                       | What are the properties of linear programming?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 7                                                                                       | State any three characteristics of Operations Research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 8                                                                                       | Define the Assignment Problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 9                                                                                       | What is Float or Slack?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 10                                                                                      | What is a decision tree?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>Section B</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 11                                                                                      | Explain the methodology of Operations Research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 12                                                                                      | Explain decisions under certainty and uncertainty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 13                                                                                      | What are the steps involved in the North West Corner Method?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 14                                                                                      | What are the objectives of network analysis?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 15                                                                                      | Solve the game with the following pay-off matrix.<br><div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: right;">Player A strate-<br/>gies</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td></td> <td>I</td> <td>II</td> <td>III</td> <td>IV</td> <td>V</td> </tr> <tr> <td>1</td> <td>-2</td> <td>5</td> <td>-3</td> <td>6</td> <td>7</td> </tr> <tr> <td>2</td> <td>4</td> <td>6</td> <td>8</td> <td>-1</td> <td>6</td> </tr> <tr> <td>3</td> <td>8</td> <td>2</td> <td>3</td> <td>5</td> <td>4</td> </tr> <tr> <td>4</td> <td>15</td> <td>14</td> <td>18</td> <td>12</td> <td>20</td> </tr> </table> <div style="text-align: left;">Player B strate-<br/>gies</div> </div> |                       |     |                          |    |  | I | II | III | IV | V | 1 | -2 | 5 | -3 | 6 | 7 | 2 | 4 | 6 | 8 | -1 | 6 | 3 | 8 | 2 | 3 | 5 | 4 | 4 | 15 | 14 | 18 | 12 | 20 |
|                                                                                         | I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | II                    | III | IV                       | V  |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 1                                                                                       | -2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5                     | -3  | 6                        | 7  |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 2                                                                                       | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6                     | 8   | -1                       | 6  |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 3                                                                                       | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2                     | 3   | 5                        | 4  |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 4                                                                                       | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 14                    | 18  | 12                       | 20 |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 16                                                                                      | Solve the following LPP graphically<br>$\text{Max } Z = 4X + 5Y$<br>Subject to<br>$X + Y \leq 20$<br>$4X + 4Y \leq 72, \quad X, Y \geq 0$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |
| 17                                                                                      | What is an Assignment Problem? Explain its features.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |     |                          |    |  |   |    |     |    |   |   |    |   |    |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |    |    |    |    |    |

|                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |     |     |     |     |     |     |     |     |     |     |           |    |    |   |   |   |    |   |    |   |    |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|----|----|---|---|---|----|---|----|---|----|
| 18                                                                    | A paper mill produces two grades of paper, X and Y. Because of raw material restrictions, it cannot produce more than 400 tonnes of grade X and 300 tonnes of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a tonne of products X and Y, respectively, with corresponding profits of 200 and 500 per tonne. Formulate this as a LPP to maximize profit and find the optimum product mix.                                                                                                                                                                         |      |     |     |     |     |     |     |     |     |     |     |           |    |    |   |   |   |    |   |    |   |    |
| <b>Section C</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |     |     |     |     |     |     |     |     |     |     |           |    |    |   |   |   |    |   |    |   |    |
| <b>Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |     |     |     |     |     |     |     |     |     |     |           |    |    |   |   |   |    |   |    |   |    |
| 19                                                                    | Explain different models and techniques of operations research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |     |     |     |     |     |     |     |     |     |     |           |    |    |   |   |   |    |   |    |   |    |
| 20                                                                    | <p>A small maintenance project consists of the following Jobs whose precedence relationships are given below.</p> <table><tr><td>Job:</td><td>1-2</td><td>1-3</td><td>2-3</td><td>2-5</td><td>3-4</td><td>3-6</td><td>4-5</td><td>4-6</td><td>5-6</td><td>6-7</td></tr><tr><td>Duration:</td><td>15</td><td>15</td><td>3</td><td>5</td><td>8</td><td>12</td><td>1</td><td>14</td><td>3</td><td>14</td></tr></table> <p>(Days)</p> <ol style="list-style-type: none"><li>1. Draw an arrow diagram</li><li>2. Find the total float for each activity</li><li>3. Find the critical path and the project duration.</li></ol> | Job: | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 | Duration: | 15 | 15 | 3 | 5 | 8 | 12 | 1 | 14 | 3 | 14 |
| Job:                                                                  | 1-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1-3  | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 |     |     |           |    |    |   |   |   |    |   |    |   |    |
| Duration:                                                             | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 15   | 3   | 5   | 8   | 12  | 1   | 14  | 3   | 14  |     |     |           |    |    |   |   |   |    |   |    |   |    |