 **Registration Number:**

**Date & Session:**

**ST. JOSEPH’S UNIVERSITY BENGALURU – 27**

**MCOM – II SEMESTER**

**SEMESTER EXAMINATION: APRIL 2023**

**(Examination conducted in May 2023)**

**MCO8320: Operation Research**

**(For current batch students only)**

**Time: 2 Hours Max Marks: 50**

**This paper contains 2 printed pages and 3 parts**

**Part A**

**Answer any 2 of the following. Each question carries 5 marks. (2 X 5 = 10)**

1. Brief out the techniques of operations research.
2. Develop a network based on the following information.

| **Activity** | **Immediate predecessors** |
| --- | --- |
| A | - |
| B | - |
| C | A |
| D | B |
| E | C, D |
| F | C, D |
| G | E |
| H | F |

1. Solve the following by North-West corner method (NWCM) and compute the transportation cost.

| **Factories** | **Warehouses** | | | | |
| --- | --- | --- | --- | --- | --- |
| **W1** | **W2** | **W3** | **W4** | **Capacity** |
| **F1** | 19 | 30 | 50 | 10 | 7 |
| **F2** | 70 | 30 | 40 | 60 | 9 |
| **F3** | 40 | 8 | 70 | 20 | 18 |
| **Requirement** | **5** | **8** | **7** | **14** | **34** |

**Part B**

**Answer any 2 of the following. Each question carries 15 marks. (2 X 15 = 30)**

1. (i) Solve the following LPP

Max Z = 100X1 + 40X2 ≤ 900

Sub to

40X1 +50X2 ≤ 900

3/2 X1 + 2/3 X2 ≤ 30

X1, X2 ≥ 0

(ii) Explain the limitations of operations research.

(10+5)

1. Given is the following pay-off matrix.

**Course of Action**

| **State of nature** | Do not expand (₹) | Expand 200 units (₹) | Expand 400 units (₹) |
| --- | --- | --- | --- |
| High demand | 2,500 | 3,500 | 5,000 |
| Medium demand | 2,500 | 3,500 | 2,500 |
| Low demand | 2,500 | 1,500 | 1,000 |

What should be the decision if we use:

1. Maximin criterion
2. The Maximax criterion
3. Maximax regret criterion
4. Obtain the optimal solution of the following assignment problem:

|  | **I** | **II** | **III** | **IV** | **V** |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 11 | 17 | 8 | 16 | 20 |  |
| **2** | 9 | 7 | 12 | 6 | 15 |  |
| **3** | 13 | 16 | 15 | 12 | 16 |  |
| **4** | 21 | 24 | 17 | 28 | 26 |  |
| **5** | 14 | 10 | 12 | 11 | 13 |  |
|  |  |  |  |  |  |  |

**Part - C**

**Answer the following compulsory question. The question carries 10 marks. (1X10 = 10)**

1. A company has 3 factories A, B & C which supply to 4 warehouses at P, Q, R & S. The monthly production capacity (tons) A, B & C are 120, 80 & 200 respectively. The monthly requirement (tons) for the warehouses P, Q, R & S are 60, 50 140 & 50 respectively. The transportation cost (₹ per ton) matrix is given below:

| **Warehouses** | **Factories** | | |
| --- | --- | --- | --- |
| **A** | **B** | **C** |
| **P** | 4 | 3 | 7 |
| **Q** | 5 | 8 | 4 |
| **R** | 2 | 4 | 7 |
| **S** | 5 | 8 | 4 |

Using Vogel’s method,find BFS to determine transportation distribution of product to warehouses to minimize transportation cost.