(i) **Printed Pages: 4** **Roll No. .....**

(ii) **Questions : 14** **Sub. Code :** | 0 | 8 | 7 | 4 |

**Exam. Code :** | 0 | 0 | 2 | 3 |

**Bachelor of Business Administration 3rd Semester**

**(1129)**

**OPERATION RESEARCH**

**Paper—BBA-202**

**Time Allowed : Three Hours]** **[Maximum Marks : 80**

**Note :—** (1) Attempt any ***four*** questions from Section-A. Each question carries **5** marks.

(2) Attempt any ***two*** questions each from Section-B and Section-C. Each question carries **15** marks.

**SECTION—A (4×5=20)**

I. Solve the game :

| | | B | |
|---|---|---|---|
| A | 5 | 1 | |
| | 3 | 4 | |

II. Solve the LPP :

$Z(max) = 3x_1 + 4x_2$

sub. to : $x_1 - x_2 \leq -1$

$-x_1 + x_2 \leq 0$

III. Solve the transportation problem :

| Warehouse — | | $W_1$ | $W_2$ | $W_3$ | Supply |
|---|---|---|---|---|---|
| Plant | A | 7 | 6 | 9 | 20 |
| | B | 5 | 7 | 3 | 28 |
| | C | 4 | 5 | 8 | 17 |
| | Demand | 21 | 25 | 19 | 65 |

IV. Solve the following Cost Matrixed Assignment :

Machine

| Jobs | $M_1$ | $M_2$ | $M_3$ | $M_4$ |
|---|---|---|---|---|
| $J_1$ | 15 | 11 | 13 | 15 |
| $J_2$ | 17 | 12 | 12 | 13 |
| $J_3$ | 14 | 15 | 10 | 14 |
| $J_4$ | 16 | 13 | 11 | 17 |

V. Define Operation Research.

VI. Explain 'MaxMin-MiniMax principle'.

**SECTION—B (2×15=30)**

VII. Solve the Transportation Problem and Test its optimality :

| Factories | Centres | | | | Available |
|---|---|---|---|---|---|
| A | 10 | 8 | 7 | 12 | 500 |
| B | 12 | 13 | 6 | 10 | 500 |
| C | 8 | 10 | 12 | 14 | 900 |
| Demand | 700 | 550 | 450 | 300 | 1900 / 2000 |

VIII. Solve the Assignment in Minimisation :

| | Courses | | | |
|---|---|---|---|---|
| Professors | 2 | 10 | 9 | 7 |
| | 15 | 4 | 14 | 8 |
| | 13 | 14 | 16 | 11 |
| | 4 | 15 | 13 | 9 |

Above figures are the preparation time for all courses.

IX. Solve the LPP by Simplex Method :

$Z(max) = 10x_1 + 5x_2$

sub. to : $4x_1 + 5x_2 \leq 100$

$5x_1 + 2x_2 \leq 80$

where $x_1\ x_2 \geq 0$

X. Explain the role of Operation Research in Management.

**SECTION—C (2×15=30)**

XI. Explain M/M/I and M/M/S queuing models in detail.

XII. Determine the optimal sequencing and total elapsed time of AB machines in the order of $\overrightarrow{AB}$.

| Jobs | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Machine A | 7 | 4 | 2 | 5 | 9 | 8 |
| Machine B | 3 | 8 | 6 | 6 | 4 | 1 |

XIII. Explain the dominance principle in game theory using the following example :

| | | Firm B | | | |
|---|---|---|---|---|---|
| | | $B_1$ | $B_2$ | $B_3$ | $B_4$ |
| Firm A | $A_1$ | 35 | 65 | 25 | 05 |
| | $A_2$ | 30 | 20 | 15 | 00 |
| | $A_3$ | 40 | 50 | 00 | 10 |
| | $A_4$ | 55 | 60 | 10 | 15 |

XIV. Explain the following terms :

(1) Pay off Matrix

(2) Saddle Point

(3) Pure and Mixed Strategy

(4) 'No Passing Rule' in Sequencing Problems

(5) Dummy in Transportation Problem.