## RAN-1189

## B.Sc. Sem-VI Examination

March / April - 2019
Mathematics-MTH-6001 (EG)
(Operations Research-II)

## સૂચના : / Instructions



## Instruction:

(1) All questions are compulsory.
(2) Figures to the right indicate marks of the question.
(3) Follow usual notations.
(4) Use of non-programmable calculator is allowed.
(5) Total marks 50.

Que:1 (a) Answer any TWO as directed.
(1) Write two applications of the assignment problem.
(2) Solve the following Assignment problem:

|  | I | II | III |
| :---: | :---: | :---: | :---: |
| $A_{1}$ | 10 | 8 | 6 |
| $A_{2}$ | 6 | 7 | 9 |
| $A_{3}$ | 9 | 12 | 10 |

(3) Write the general mathematical form of Transportation problem.

Que:1(b) Attempt any ONE.
(1) Consider the game with following payoff table. Determine the value of the game.

|  | Player B |  |
| :---: | :---: | :---: |
| Player $\boldsymbol{A}$ | B1 | $\boldsymbol{B 2}$ |
| $\boldsymbol{A}_{1}$ | 7 | -2 |
| $\boldsymbol{A}_{2}$ | 5 | 4 |

(2) Consider the game with following payoff table. Determine the value of the game.

|  | Player B |  |
| :---: | :---: | :---: |
| Player $\boldsymbol{A}$ | B1 | B2 |
| $\boldsymbol{A}_{1}$ | -3 | 4 |
| $\boldsymbol{A}_{2}$ | 2 | -1 |

Que:2 Attempt any TWO.
(1) Find the assignment of workers to machines that will minimize the total time taken.

Machines

|  |  | $M_{1}$ | $M_{2}$ | $M_{3}$ | $M_{4}$ | $M_{5}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Manufacturers | $A_{1}$ | 25 | 28 | 29 | 28 | 31 |
|  | $B_{2}$ | 31 | 29 | 30 | 31 | 29 |
|  | $C_{3}$ | 27 | 26 | 28 | 27 | 26 |

(2) Solve the Assignment Problem:

|  |  | Jobs |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $J_{1}$ | $J_{2}$ | $J_{3}$ | $J_{4}$ | $J_{5}$ |
| Employee | E1 | 5 | 5.1 | 4.2 | 5.7 | 4.9 |
|  | E2 | 5.1 | 1.5 | 5.8 | 6 | 4.3 |
|  | E3 | 6.5 | 5.5 | 4.6 | 6.4 | 6 |

(3) Solve the Assignment Problem:

## Salesmen

|  |  | A | B | C | D | D |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | I | 25 | 30 | 38 | 50 | 15 |
|  | II | 28 | 26 | 35 | 50 | 20 |
| Counters | III | 30 | 35 | 40 | 55 | 18 |
|  | IV | 15 | 25 | 30 | 48 | 12 |
|  | $V$ | 30 | 27 | 32 | 48 | 16 |

(4) Use graphical method to solve the following game and find the value of the game.

## Player B

| Player A | $A_{1}$ | $\mathrm{B}_{1}$ | $\mathrm{B}_{2}$ | $\mathrm{B}_{3}$ | $\mathrm{B}_{4}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 | 4 | 6 | 8 |
|  |  | 8 | 3 | 4 | 2 |

Que:3 Attempt any TWO.
(1) Find an initial basic feasible solution for the following Transportation problem using
(i) North west corner method
(ii) Least cost method.

|  |  | Destinations |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\boldsymbol{D}_{\mathbf{1}}$ | $\boldsymbol{D}_{\mathbf{2}}$ | $\boldsymbol{D}_{\mathbf{3}}$ | $\boldsymbol{D}_{\mathbf{4}}$ | Supply |
| Sources | $\mathrm{S}_{\mathbf{1}}$ | 21 | 6 | 15 | 3 | $\mathbf{1 1 0}$ |
|  | $\mathrm{~S}_{\mathbf{2}}$ | 17 | 18 | 4 | 23 | $\mathbf{1 3 0}$ |
|  | $\mathrm{~S}_{\mathbf{3}}$ | 32 | 27 | 18 | 14 | $\mathbf{1 9 0}$ |
|  | Demand |  | $\mathbf{6 0}$ | $\mathbf{1 0 0}$ | $\mathbf{1 2 0}$ | $\mathbf{1 5 0}$ |  |

(2) Determine an optimal solution for the following transportation problem using MODI method:

|  |  | Destinations |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\boldsymbol{D}_{\mathbf{1}}$ | $\boldsymbol{D}_{\mathbf{2}}$ | $\boldsymbol{D}_{\mathbf{3}}$ | $\boldsymbol{D}_{\mathbf{4}}$ | Supply |
| Sources | $\boldsymbol{S}_{\mathbf{1}}$ | 3 | 6 | 8 | 5 | $\mathbf{2 0}$ |
|  | $\boldsymbol{S}_{\mathbf{2}}$ | 6 | 1 | 2 | 5 | $\mathbf{2 8}$ |
|  | $\boldsymbol{S}_{\mathbf{3}}$ | 7 | 8 | 3 | 9 | $\mathbf{1 7}$ |
|  | Demand |  | $\mathbf{1 5}$ | $\mathbf{1 9}$ | $\mathbf{1 3}$ | $\mathbf{1 8}$ |  |

(3) Solve the following transportation problem:

|  |  | Destinations |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\boldsymbol{D}_{\mathbf{1}}$ | $\boldsymbol{D}_{\mathbf{2}}$ | $\boldsymbol{D}_{\mathbf{3}}$ | $\boldsymbol{D}_{\mathbf{4}}$ | $\boldsymbol{D}_{\mathbf{5}}$ | Supply |
| Sources | $\boldsymbol{S}_{\mathbf{1}}$ | 5 | 3 | 4 | 6 | 4 | $\mathbf{4}$ |
|  | $S_{\mathbf{2}}$ | 4 | 3 | 10 | 5 | 6 | $\mathbf{2}$ |
|  | $\boldsymbol{S}_{\mathbf{3}}$ | 4 | 6 | 9 | 4 | 3 | $\mathbf{4}$ |
|  | Demand |  | $\mathbf{2}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{2}$ |  |

(4) Use graphical method to solve the following game and find the value of the game.

|  |  | Player $\boldsymbol{B}$ |  |
| :---: | :---: | :---: | :---: |
|  |  | $\boldsymbol{B}_{\mathbf{1}}$ | $\boldsymbol{B}_{\mathbf{2}}$ |
| Player $\boldsymbol{A}$ | $\boldsymbol{A}_{\mathbf{1}}$ | 2 | 5 |
|  | $\boldsymbol{A}_{\mathbf{2}}$ | 4 | 6 |
|  | $\boldsymbol{A}_{\mathbf{3}}$ | 3 | 3 |
|  | $\boldsymbol{A}_{\mathbf{4}}$ | 8 | 7 |
|  | $\boldsymbol{A}_{\mathbf{5}}$ | 4 | 8 |
|  | $\boldsymbol{A}_{\mathbf{6}}$ | 5 | 4 |

