



HDI-P3050

Seat No. _____

M. C. A. (Sem. III) (CBCS) Examination

November / December – 2017

Operation Research

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

1 (A) Attempt the following objective question : 4

- (1) Give any two names of OR models.
- (2) Explain objective oriented approach of OR.
- (3) Give the advantages of OR.
- (4) Define Linear.

(B) Attempt any one out of two from the following : 2

- (1) What is Operation Research?
- (2) List out the features of OR.

(C) Attempt any one of two from the following : 3

(1) Write the dual of the following LP problem :

$$\text{Min : } Z = 3x_1 - 2x_2 + 4x_3$$

Subject to constraints :

$$(a) \quad 3x_1 + 5x_2 + 4x_3 \geq 7$$

$$(b) \quad 6x_1 + x_2 + 3x_3 \geq 4$$

$$(c) \quad 7x_1 - 2x_2 - x_3 \leq 10$$

$$(d) \quad 4x_1 + 7x_2 - 2x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0$$

(2) What are the phases of OR ?

(D) Attempt any one out of two from the following : 5

(1) Use the graphical method to solve following problem :

$$\text{Maximize } Z = 15x_1 + 10x_2$$

Subject to constraints :

(a) $4x_1 + 6x_2 \leq 360$

(b) $3x_1 \leq 180$

(c) $5x_2 \leq 200$

(2) Use the Dual Simplex method to solve following problem:

$$\text{Max. } Z = -2x_1 - x_3$$

Subject to constraints :

(a) $x_1 + x_2 - x_3 \geq 5$

(b) $x_1 - 2x_2 + 4x_3 \geq 8$

2 (A) Attempt the following questions : 4

- (1) In simplex method, when type of constraints is less than or equal to, what type of extra variable is needed?
- (2) Non basic variables are those that have value of zero. This statement is true or false ?
- (3) Give the formula to find out the new replaced row.
- (4) Big-M method is also known as _____ method.

(B) Attempt any one out of two from the following : 2

- (1) In simplex method, give the formula to find Z and ΔZ .
- (2) Give the conditions of Big-M method for maximization case.

(C) Attempt any one out of two from the following : **3**

- (1) Which are the cases for change in objective function coefficient?
- (2) Write a note on sensitivity analysis.

(D) Attempt any one out of two from the following : **5**

- (1) Solve the following problem using Revised simplex method :

$$\text{Max. } Z = 2x_1 + x_2$$

Subject to constraints :

(a) $3x_1 + 4x_2 \leq 6$

(b) $6x_1 + x_2 \leq 3$

- (2) Consider following LP problem :

$$\text{Max. } Z = 3x_1 + 5x_2$$

Subject to constraints :

(a) $3x_1 + 2x_2 \leq 18$

(b) $x_1 + 2x_2 \leq 4$

(c) $x_2 \leq 6$

Obtain an optimal solution of the given problem. Suppose x_6 is added to the given LP problem. The coefficients of x_6 in the constraint are 1, 1, 1 and objective function coefficient is 2. Find out the change in optimal problem.

3 (A) Attempt the following questions : **4**

- (1) Give the full form of VAM.
- (2) Explain RIM condition.
- (3) What do you mean by non degenerate solution?
- (4) Give the names of initial solution methods.

(B) Attempt any one out of two from the following : 2

- (1) Write the steps of NWCM.
- (2) What are the conditions to be satisfied by the solutions obtained by any of the initial solution methods?

(C) Attempt any one out of two from the following : 3

- (1) Draw the mathematical model of Transportation Problem.
- (2) Solve using LCM :

	D_1	D_2	D_3	D_4	<i>Supply</i>
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
<i>Demand</i>	5	8	7	14	

(D) Attempt any one out of two from the following : 5

- (1) Find out the feasible solution to the following problem using VAM method :

	D_1	D_2	D_3	D_4	<i>Supply</i>
S_1	21	16	15	3	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
<i>Demand</i>	6	10	12	15	

- (2) Solve using MODI method :

	D_1	D_2	D_3	<i>Supply</i>
S_1	4	8	8	76
S_2	16	24	16	82
S_3	8	16	24	77
<i>Demand</i>	72	102	41	

4 (A) Attempt the following questions : 4

- (1) What is full form of AP?
- (2) Give the name of the mathematician who developed Hungarian method.
- (3) Which type of matrix should be in Hungarian method?
- (4) Give two names of solution methods to solve AP.

(B) Attempt any one out of two from the following : 2

- (1) Explain travelling salesman problem.
- (2) Explain Hungarian method.

(C) Attempt any one out of two from the following : 3

- (1) Draw the mathematical model of Assignment problem.
- (2) Find out the solution using Hungarian method :

	<i>A</i>	<i>B</i>	<i>C</i>
<i>A</i>	120	100	80
<i>B</i>	80	90	110
<i>C</i>	110	140	120

(D) Attempt any one out of two from the following : 5

- (1) Find out the solution using Hungarian method :

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>A</i>	10	5	13	15	16
<i>B</i>	3	9	18	13	6
<i>C</i>	10	7	2	2	2
<i>D</i>	7	11	9	7	12
<i>E</i>	7	9	10	4	12

- (2) Find out the solution using Travelling salesman problem :

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>A</i>	–	2	5	7	1
<i>B</i>	6	–	3	8	2
<i>C</i>	8	7	–	4	7
<i>D</i>	12	4	6	–	5
<i>E</i>	1	3	2	8	–

- 5 (A) Attempt the following questions : 4

- (1) Give the full form of PERT.
- (2) What is network?
- (3) Which company developed CPM?
- (4) Give the full form of AOA.

- (B) Attempt any one out of two from the following : 2

- (1) Explain slack of an event.
- (2) Give the formula of Total float and Free float.

- (C) Attempt any one out of two from the following : 3

- (1) Draw the network diagram from the following activities :

<i>Activity</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>
<i>Predecessor Activity</i>	–	–	–	<i>A</i>	<i>A, B</i>	<i>A, B, C</i>	<i>D, E, F</i>	<i>F</i>

- (2) What do you mean by Activity ? Explain its different types.

(D) Attempt any one out of two from the following : 5

(1) Following table shows the activities, predecessor activities and time duration :

<i>Activity</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>
<i>Predecessor Activity</i>	–	<i>A</i>	–	<i>C</i>	<i>B, C</i>	<i>D, E</i>	<i>F</i>
<i>Time Duration</i>	6	1	8	5	9	12	3

- (a) Draw the network diagram for the project.
 (b) Find the critical path.

(2) Study the following table :

Activities	Estimated Duration (weeks)		
	Optimistic time	Most Likely time	Pessimistic time
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
4 – 6	2	5	8
5 – 6	3	6	15

- (a) Draw the network diagram and find the critical path.
 (b) What is the expected project length ?