Seat No. : 1121

NM-107

November-2017

B.B.A., Sem.-V

CC-304 : Operations Research and Quantitative Techniques

Time : 3 Hours] [Max. Marks : 70

1. (a) What is Linear Programming ? Give its mathematical formation. State the uses of Linear Programming. 4

OR

Give meaning of O.R. and write the techniques of O.R.

(b) Maximize the objective function $z = 16x + 24y$ subject to the following constraints : 4

$x, y \geq 0, x + y \leq 18, x \geq 4, y \geq 6, 6x + 12y \leq 72$

OR

Minimize $z = 4x + 3y$ such that $x, y \geq 0, 4x + 2y \geq 80, x + 4y \geq 100, x + y \geq 70$

(c) Hero Motors company manufacture two types of motor bikes : Hero Splendor and Hero Passion. The company has to manufacture atleast 80 Splendor and 60 Passion bikes per week. The company cannot prepare more than 240 bikes per week. For preparing one Splendor bike 60 machine hours and for preparing one Passion bike 120 machine hours required. The company can afford at the most 9,600 machine hours per week. Company earn profit of ₹ 4,000 each for Splendor and ₹ 6,000 each for Passion. How many bikes of each type should be manufacture to earn maximum profit ? 6

OR

A manufacturer produce two types of product M and D. To manufacture one unit of M 4 workers and eight machine hours are required and for one unit of D 10 workers and four machine hours are required. At the most 240 workers and 160 machine hours are required. Profit of each unit of M is ₹ 6 and ₹ 8 for unit of D. How many units of M and D should be produced to get maximum profit ?

2. (a) Discuss unbalanced transportation problem. 4

OR

Discuss restricted transportation problem.

(b) Obtain a basic feasible solution of the following transportation by North-West Corner rule. 5

	D_1	D_2	D_3	D_4	D_5	Supply
	4	22	20	6	14	8
	2	8	14	4	2	16
	6	18	8	16	24	18
Requirements	6	6	8	10	12	42

OR

Find initial solution by least cost method.

	A	B	C	D	Supply
O_1	6	12	6	24	60
O_2	18	14	12	6	100
O_3	24	12	30	54	40
Demand	40	80	60	20	200

(c) Obtain basic feasible solution by Vogel's method. 5

A	B	C	Supply
30	26	66	5
38	29	54	15
70	60	30	25
20	10	15	45

OR

Obtain optimal solution of following problem.

	A	B	C	D	Supply
O_1	40	36	44	26	20
O_2	20	40	34	48	18
O_3	38	34	36	24	22
Demand	20	14	16	10	

3. (a) State the advantages of PERT. 4

OR

Explain critical path method.

(b) Prepare PERT chart for the following project and find critical path. 5

Activity	1 – 2	1 – 6	2 – 3	2 – 4	3 – 5	4 – 5	6 – 7	5 – 8	7 – 8
Time	8	4	14	7	13	8	10	5	20

OR

Find critical Path.

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	14	24	26
1-3	14	20	24
2-5	16	26	30
3-5	20	24	44
5-6	20	28	36

(c) Find critical path also find EFT, LFT and Float time. 5

Activity	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	4 – 5
Time	25	30	15	17	10	15

OR

Find critical path and find EFT, LFT and Float time.

Activity	1 – 2	2 – 3	3 – 4	3 – 5	4 – 6	5 – 6	6 – 7
Time	2	4	3	2	4	3	8

4. (a) What is Assignment Problem ? Explain Unbalanced Assignment Problem. 4

OR

What is Game theory ? What are the assumption made in game theory ?

(b) Solve the assignment problem so that the cost is minimum. Also find total minimum cost. 5

	I	II	III	IV
A	42	40	51	67
B	57	42	63	58
C	49	52	48	61
D	41	45	60	55

OR

Solve the assignment problem so as to maximize the profit.

	A	B	C	D
P	22	24	26	28
Q	28	30	32	34
R	30	32	34	36
S	36	34	32	30

(c) Solve the following payoff matrix, determine optimal strategies and value of game. **5**

	Player B	
Player A	2	14
	12	4

OR

Solve the following game :

$$\begin{bmatrix} 27 & 24 & -21 \\ 9 & -18 & 12 \\ 18 & 21 & -21 \end{bmatrix}$$

5. Answer the following questions : **14**

(1) Linear programming was first introduced by _____.

(2) Full form of V.A.M. is _____.

(3) Hungarian method is used for _____ problem.

(4) Test of optimality can be done by _____ method.

(5) Other name of matrix minima is _____.

(6) In linear programming, $x \geq 0$ and $y \geq 0$ are called _____.

(7) How many final events can there be in any PERT network ? _____.

(8) In PERT the completion of an activity is called _____.

(9) If no. of row and no. of column are not equal at that time problem is called _____ transportation.

(10) In matrix minima method, which matrix should be select first ? _____.

(11) PERT was develop by U.S. Navey in _____ year.

(12) In linear programming original problem is called _____ in.

(13) Equations representing the restriction of resources in the given problem are known as _____.

(14) Full form of CPM is _____.

_____