SUBJECT NAME : **Resource Management Techniques**

SUBJECT CODE : **CS 6704**

MATERIAL NAME : **University Questions**

REGULATION : **R2013**

UPDATED ON : **November 2017** **(Upto N/D 2017 Q.P)**

(Scan the above Q.R code for the direct download of this material)

Unit – I (Linear Programming)

• Graphical Method

1. Solve the following LP problem using graphical method. (A/M 2017)

   Maximize $z = 6x_1 + 8x_2$

   Subject to

   $5x_1 + 10x_2 \le 60$

   $4x_1 + 4x_2 \le 60$

   x_1 and $x_2 \ge 0$

2. Solve the following linear programming problem using graphical method.

   Maximize $z = 100x_1 + 80x_2$ (N/D 2016)

   Subject to

   $5x_1 + 10x_2 \le 50$

   $8x_1 + 2x_2 \ge 16$

   $3x_1 - 2x_2 \ge 6$

   x_1 and $x_2 \ge 0$

• Simplex Method

1. Solve the LPP by simplex method (A/M 2017)

   Minimize $z = x_2 - 3x_3 + 2x_5$

   Subject to

   $$3x_2 - x_3 + 2x_5 \le 7$$

   $$-2x_2 + 4x_3 \le 12$$

   $$-4x_2 + 3x_3 + 8x_5 \le 10$$

   $$x_2, x_3, x_5 \ge 0$$

2. Solve the following LPP by simplex method.

   Maximize $z = 4x_1 + x_2 + 3x_3 + 5x_4$ (N/D 2016)

   Subject to

   $$4x_1 - 6x_2 - 5x_3 + 4x_4 \ge -20$$

   $$3x_1 - 2x_2 + 4x_3 + x_4 \le 10$$

   $$8x_1 - 3x_2 + 3x_3 + 2x_4 \le 20$$

   $$x_1,\ x_2,\ x_3,\ x_4 \ge 0$$

3. A manufacturer makes two components, T and A, in a factory that is divided into two shops. Shop I, which performs the basic assembly operation, must work 5 man-days on each component T but only 2 man-days on each component A. Shop II, which performs finishing operation, must work 3 man-days for each of component T and A it produces. Because of men and machine limitations, Shop I has 180 man-days per week available, while Shop II has 135 man-days per week. If the manufacturer makes a profit of Rs. 300 on each component T and Rs. 200 on each component A, how many of each should be produced to maximize his profit. Use simplex method. (N/D 2017)

Unit – II (Duality and Networks)

• Dual Simplex Method

1. Using dual simplex method solve the LPP. (A/M 2017)

   Minimize $z = 2x_1 + x_2$

   Subject to

   $3x_1 + x_2 \geq 3$

   $4x_1 + 3x_2 \geq 6$

   $x_1 + 2x_2 \geq 3$

   and $x_1, x_2 \geq 0$

2. Use dual simplex method to solve the LPP. (N/D 2016),(N/D 2017)

   Maximize $z = -3x_1 - 2x_2$

   Subject to

   $x_1 + x_2 \geq 1$

   $x_1 + x_2 \leq 7$

   $x_1 + 2x_2 \geq 10$

   $x_2 \leq 3$

   and $x_1, x_2 \geq 0$

3. Elucidate the procedure for formulating linear programming problems. Explain the advantages and limitations of linear programming. (N/D 2017)

• Transportation Problems

1. Obtain an optimum basic feasible solution to the following transportation problem:

	To			**Available**
From	7	3	2	**2**
	2	1	3	**3**
	3	4	6	**5**
Demand	**4**	**1**	**5**	**10**

2. Solve the transportation problem: (A/M 2017)

	1	2	3	4	Supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

• Assignment Problems

1. Solve the following assignment problem for maximization given the profit matrix (profit in rupees): (N/D 2017)

Machines

		P	Q	R	S
Job	A	51	53	54	50
	B	47	50	48	50
	C	49	50	60	61
	D	63	64	60	60

2. Consider the problem of assigning four sales persons to four different sales regions as shown in the following table such that the total sales is maximized.

(N/D 2016)

Sales region

Salesman		**1**	**2**	**3**	**4**
	1	10	22	12	14
	2	16	18	22	10
	3	24	20	12	18
	4	16	14	24	20

The cell entries represent annual sales figures in lakhs of rupees. Find the optional allocation of the sales persons to different regions.

Unit – III (Integer Programming)

- ## Integer Programming Problem (IPP)

1. Find the optimum integer solution to the following linear programming problem:

   Maximize $z = x_1 + 2x_2$ (A/M 2017)

   Subject to

   $2x_2 \le 7$

   $x_1 + x_2 \le 7$

   $2x_1 = 11$

   and $x_1, x_2 \ge 0$ and are integers.

2. Solve the following IPP. (N/D 2016)

Minimize $z = -2x_1 - 3x_2$

Subject to

$$2x_1 + 2x_2 \le 7$$

$$x_1 \le 2$$

$$x_2 \le 2$$

and $x_1, x_2 \ge 0$ and integers.

• Branch and Bound Method

1. Use Branch and bound method to solve the following:

Maximize $z = 2x_1 + 2x_2$ (A/M 2017),(N/D 2017)

Subject to

$$5x_1 + 3x_2 \le 8$$

$$x_1 + 2x_2 \le 4$$

and $x_1, x_2 \ge 0$ and integers.

• Dynamic Programming Problem

1. Solve the following LPP using dynamic programming approach:

Maximize $z = 3x_1 + 5x_2$ (N/D 2017)

Subject to

$$x_1 \le 4$$

$$x_2 \le 6$$

$$3x_1 + 2x_2 \le 18$$

and $x_1, x_2 \ge 0$

Unit – IV (Classical Optimisation Theory)

• Jacobean Method

1. Maximize $f(x) = x_1^2 + 2x_2^2 + 10x_3^2 + 5x_1x_2$ (A/M 2017)

   Subject to

   $g_1(x) = x_1 + 2x_2^2 + 3x_2x_3 - 5 = 0$

   $g_2(x) = x_1^2 + 5x_1x_2 + x_3^2 - 75 = 0$

   Apply the Jacobean method to find $\partial f(x)$ in the feasible neighbourhood of the feasible point $(1,1,1)$. Assume that the feasible neighbourhood is specified by $\partial g_1 = -0.1$, $\partial g_2 = 0.2$ and $\partial x_1 = 0.1$.

2. Using Jacobian method $z = 2x_1 + 3x_2$ (N/D 2016)

   Subject to

   $x_1 + x_2 + x_3 = 5$

   $x_1 + x_2 + x_4 = 3$

   $x_1, x_2, x_3, x_4 \geq 0$.

• Lagrangian Method

1. Explain Lagrangian method. (N/D 2017)

2. Solve the nonlinear programming problem by Lagrangian multiplier method.

   Minimize $z = x_1^2 + 3x_2^2 + 5x_3^2$ (A/M 2017)

   Subject to the constraints

   $x_1 + x_2 + 3x_3 = 2$

   $5x_1 + 2x_2 + x_3 = 5$

   $x_1, x_2, x_3 \geq 0$.

• Kuhn-Tucker Method

1. Explain Khun-Tucker conditions. (N/D 2017)

2. Solve the nonlinear programming problem by Khun-Tucker conditions. (N/D 2016)

   Minimize $f(x) = x_1^2 + x_2^2 + x_3^2$

   Subject to

   $$g_1(x) = 2x_1 + x_2 - 5 \le 0$$

   $$g_2(x) = x_1 + x_2 - 2 \le 0$$

   $$g_3(x) = 1 - x_1 \le 0$$

   $$g_4(x) = 2 - x_2 \le 0$$

   $$g_5(x) = -x_3 \le 0$$

Unit – V (Object Scheduling)

• CPM

1. A project schedule has the following characteristics: (A/M 2017)

Activity:	1-2	1-4	1-7	2-3	3-6	4-5	4-8	5-6	6-9	7-8	8-9
Duration:	2	2	1	4	1	5	8	4	3	3	5

   (i) Construct a network and find the critical path and the project duration.

   (ii) Activities 2 – 3, 4 – 5, 6 – 9 each requires one unit of the same key equipment to complete it. Do you think availability of one unit of the equipment in the organization is sufficient for completing the project without delaying it; if so what is the schedule of these activities?

2. A project consists of activities from A to J as shown in the following table. The immediate predecessor(s) and the duration in weeks of each of the activities are given in the same table. Draw the project network and, find the critical path and the corresponding project completion time. Also, find the total float as well as free float for each of the non-critical activities. (N/D 2016)

Activity:	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor(s):	---	---	A, B	A, B	B	C	D	F, G	F,G	E, H
Duration (weeks)	4	3	2	5	6	4	3	7	4	2

- **PERT**

1. The following indicates the details of a project. The durations are in days. 'a' refers to optimistic time, 'm' refers to most likely tie and 'b' refers to pessimistic time duration.

Activity:	1-2	1-3	1-4	2-4	2-5	3-4	4-5
a :	2	3	4	8	6	2	2
m :	4	4	5	9	8	3	5
b :	5	6	6	11	12	4	7

(i) Draw the network (A/M 2017),(N/D 2017)

(ii) Find the critical path

(iii) Determine the expected standard deviation of the completion time

2. Consider the data of a project summarized in the following table: (N/D 2016)

Activity:	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor(s):	---	---	---	A	A	A	B, C	C	D	E, G
a :	4	1	2	1	1	1	1	4	2	6
m :	4	2	5	4	2	5	2	4	2	7
b :	10	9	14	7	3	9	9	4	8	8

(i) Construct the project network.

(ii) Find the expected duration and the variance of each activity.

(iii) Find the critical path and the expected project completion time.

(iv) What is the probability of completing the project on or before 35 weeks?

3. Explain difference between PERT and CPM.

----*All the Best*----