(b) Solve the nonlinear programming problem by Lagrangian multiplier method.

Minimize $z = x_1^2 + 3x_2^2 + 5x_3^2$

Subject to the constraints

$x_1 + x_2 + 3x_3 = 2$
$5x_1 + 2x_2 + x_3 = 5$
$x_1, x_2, x_3 \geq 0.$ (16)

15. (a) The following indicates the details of a project. The durations are in days. 'a' refers to optimistic tine, 'm' refers to most likely time 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

(ii) Find the critical path

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

Or

(b) A project schedule has the following characteristics :

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 PERT 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?

31/5/17

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71693

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh Semester

Computer Science and Engineering

CS 6704 – RESOURCE MANAGEMENT TECHNIQUES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Explain slack variables of LP problem.

2. What is sensitivity analysis?

3. Define primal and dual problem?

4. Write the difference between the transportation problem and the assignment problem.

5. List different types of Integer programming problems.

6. Write the Gomory's constraint for the all integer programming problem whose simplex table (with non integer solution) given below :

$C_j \rightarrow 2 \quad 20 \quad -10 \quad 0$

Basic variable	C_B	X_B	X_1	X_2	X_3	S_1
x_2	20	$\frac{5}{8}$	0	1	$\frac{1}{5}$	$\frac{3}{40}$
x_1	2	$\frac{5}{4}$	1	0	0	$\frac{1}{4}$
	$z = C_B X_B = 15$		0	0	−14	−1

7. Write down the necessary condition for general non linear programming problem by Lagrange's multiplier method for equal constraints.

8. Define the Jacobian matrix J and the control matrix C.

9. Draw the network for the project whose activities and their precedence relationship are as given below :

Activities :	A	B	C	D	E	F	G	H	I
Precedence :	–	A	A	–	D	B, C, E	F	E	G, H

10. State the rules for network construction.

PART B — (5 × 16 = 80 marks)

11. (a) Solve the following LP problem using graphical method.

Maximize $z = 6x_1 + 8x_2$

Subject to

$5x_1 + 10x_2 \leq 60$

$4x_1 + 4x_2 \leq 60$

x_1 and $x_2 \geq 0$. (16)

Or

(b) Solve the LPP by simplex method

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

Subject to

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

$-2x_2 + 4x_3 \leq 12$

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

$x_2, x_3, x_5 \geq 0$. (16)

12. (a) Using dual simplex method solve the LPP

Minimize $z = 2x_1 + x_2$

Subjeet to

$3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \geq 3$

and $x_1, x_2 \geq 0$. (16)

Or

(b) Solve the transportation problem : (16)

	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	

13. (a) Find the optimum integer solution to the following linear programming problem :

Maximize $z = x_1 + 2x_2$

Subject to

$2x_2 \leq 7$

$x_1 + x_2 \leq 7$

$2x_1 = 11$

and $x_1, x_2 \geq 0$ and are integers. (16)

Or

(b) Use Branch and Bound method to solve the following :

Maximize $z = 2x_1 + 2x_2$

Subject to

$5x_1 + 3x_2 \leq 8$

$x_1 + 2x_2 \leq 4$

and $x_1, x_2 \geq 0$ and integers. (16)

14. (a) Maximize $f(x) = x_1^2 + 2x_2^2 + 10x_3^2 + 5x_1x_2$

Subject to

$g_1(x) = x_1 + x2_2^2 + 3x_2x_3 - 5 = 0$

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

Apply the Jacobian 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 $\partial g_1 = -0.1$, $\partial g_2 = .02$ and $\partial x_1 = .01$. (16)

Or