(7 pages)

MAY 2016 **P/ID 17414/RBR**

Time : Three hours Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

1. (a) Find the feasible space graphically for the following

(i) $x_1 + x_2 \leq 1$

$x_1 \leq x_2$

$2x_2 \leq 1$

$x_1, x_2 \geq 0$.

(ii) $x_1 - x_2 \geq 0$

$-3x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$.

Or

(b) Explain Two-phase method.

2. (a) (i) Define - Optimum dual solution.

(ii) Formulate the dual of the following LPP :

Maximize $z = 5x_1 + 3x_2$

Subject to the constraints

$3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$

$x_1 \geq 0, x_2 \geq 0$

Or

(b) Explain North west corner method.

3. (a) Explain dynamic programming algorithm.

Or

(b) Using the bounded variable technique, solve the following LPP.

Maximize $z = x_2 + 3x_3$

Subject to constraints

$x_1 + x_2 + x_3 \leq 10$

$x_1 - 2x_3 \leq 0$

$2x_2 - x_3 \leq 10$

$0 \leq x_1 \leq 8$

$0 \leq x_2 \leq 4, \ x_3 \geq 0.$

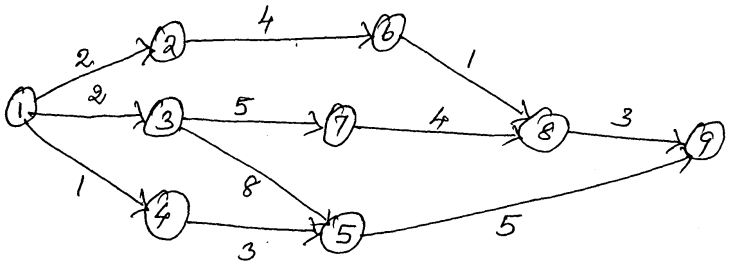
4. (a) We have five jobs, each of which must go through the two machines A and B in the order AB, processing times in hours are given in the table below:

Job(i)	1	2	3	4	5
Machine A (Aj)	5	1	9	3	10
Machine B (Bj)	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the total elapsed time.

Or

(b) Find the Critical path and calculate the slack time for the following PERT diagram:



5. (a) Two manufacturers X and Y are competing with each other in a very restricted market. The state transition matrix for the market summarizes the probabilities that customers will move from one manufacturer to the other in any one month. Interpret the state – transition matrix in terms of (i) retention and loss and (ii) retention and gain.

	To	
From	X	Y
X	0.7	0.3
Y	0.1	0.9

Or

(b) Customers arrive at the rate of twenty per hour and the present serving arrangements can cope with per hour for an eight hour day. Calculate and state: (i) the average time in the queue (ii) the implied value of customer's time if the service has considered, but rejected a faster service arrangement which would cost an extra Rs. 20 for an 8 hour day and would raise the service rate to 40 per hour.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. Use revised Simplex method to solve the linear programming problem:

Maximize $z = 2x_1 + x_2$

Subject to constraints

$3x_1 + 4x_2 \leq 6$

$6x_1 + x_2 \leq 3$

$x_1, x_2 \geq 0.$

7. Use two phase simplex method to maximize

$Z = 3x_1 + 2x_2 + 2x_3$

Subject to the constraints

$5x_1 + 7x_2 + 4x_3 \leq 7$

$-4x_1 + 7x_2 + 5x_3 \geq -2$

$3x_1 + 4x_2 - 6x_3 \geq 29/7;$

$x_1, x_2, x_3 \geq 0.$

8. Solve the Assignment problem

Tasks	Men			
	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

9. Using the bounded variable technique, solve the following LPP :

Maximize $Z = 3x_1 + 5x_2 + 2x_3$,

subject to the constraints

$x_1 + 2x_2 + 2x_3 \le 14$

$2x_1 + 4x_2 + 3x_3 \le 23$

$0 \le x_1 \le 4$

$2 \le x_2 \le 5$

$0 \le x_3 \le 3.$

10. Use Gomory's method to solve the LPP :

Maximize $Z = 9x_1 + 10x_2$,

subject to the constraints

$x_1 + x_3 = 3$

$2x_1 + 5x_2 + x_4 = 15$

$x_1, x_2, x_3, x_4 \ge 0$ and integers.

11. Minimize $z = y_1^2 + y_2^2 + y_3^2$,

subject to the constraints

$y_1 + y_2 + y_3 \ge 15$

and $y_1, y_2, y_3 \ge 0$ by using Dynamic programming problem.

12. We have five jobs, each of which must go through machines A, B and C in the order ABC. Processing times (in hours) are given in the following table.

Job	1	2	3	4	5
Machine A (Aj)	8	10	6	7	11
Machine B (Bj)	5	6	2	3	4
Machine C (Cj)	4	9	8	6	5

Determine a sequence of these jobs will minimize the total elapsed time T. Also find T and idle time for machines and C.

13. (a) Explain the elements of queuing problem.

(b) At what average rate must a clerk at a super market work in order to ensure a probability of 0.90 that the customers will not wait longer than 12 minutes? It is assumed that there is only one counter, at which customer arrive in a Poisson fashion at an average rate of 15 per hour. The length of service by the clerk has an exponential distribution.