(6 pages)

MAY 2012

P/ID 77508/PMBH/ PMB1H

Time : Three hours Maximum : 100 marks

PART A — (5 × 6 = 30 marks)

Answer any FIVE questions.

All questions carry equal marks.

1. Distinguish between alternate optima and infeasible solution in linear programming with suitable sketches.

2. List and explain the assumptions of linear programming.

3. Compare and contrast transportation problem and assignment problem.

4. Explain the following:

   (a) Total float

   (b) Free float

   (c) Latest start time.

5. Discuss the time-cost trade-off in network crashing with a suitable graph.

6. Give the classification of queueing system.

7. What are the standard results that are obtained in queueing simulation? How will you incorporate the necessary modules for them in the simulation logic?

8. List and explain the terminologies of game theory.

PART B — ($5 \times 10 = 50$ marks)

Answer any FIVE questions.

All questions carry equal marks.

9. Solve the following LP problem graphically.

Maximize $Z = 60X_1 + 90X_2$

Subject to

$X_1 + 2X_2 \leq 40$

$2X_1 + 3X_2 \leq 90$

$X_1 - X_2 \geq 10$

X_1 and $X_2 \geq 0$

10. Find the optimal solution to the following transportation problem

		Warehouse				Capacity
		W_1	W_2	W_3	W_4	
Factory	F_1	10	30	50	10	7
	F_2	70	30	40	60	9
	F_3	40	8	70	20	18
Requirement		5	8	7	14	34

11. Consider the problem of assigning four sales person to four different sales region as shown below such that the total sales is maximized. The cell entries represent annual sales figures in crores of rupees. Find the optimal allocation of the sales persons to different sales region.

		Sales region			
		1	**2**	**3**	**4**
	1	5	11	8	9
Salesman	**2**	5	7	9	7
	3	7	8	9	9
	4	6	8	11	12

12. Consider the following table summarizing the details of a project.

Activity	Predecessor(s)	Duration (weeks)		
		a	m	b
A	–	4	4	10
B	–	1	2	9
C	–	2	5	14
D	A	1	4	7

Activity	Predecessor(s)	Duration (weeks)		
		a	m	b
E	A	1	2	3
F	A	1	5	9
G	B, C	1	2	9
H	C	4	4	4
I	D	2	2	8
J	E, G	6	7	8
K	F,H	2	2	8
L	F,H	5	5	5
M	I,J, K	1	2	9
N	L	6	7	8

(a) Construct the project network.

(b) Find the expected duration and variance of each activity

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

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

13. Cars arrive at a drive-in restaurant with a mean arrival rate of 30 cars per hour and the service rate of the cars is 22 cars per hour. The arrival rate and the service rate follow Poisson distribution. The number of parking space for cars is only 5. Find the standard results of this system.

14. For a product to be manufactured within the company, the details are as follows : r = 36,000 units/year, k = 72,000 units/year, C_0 = Rs.250 per set up and C_c = Rs.25/unit/year. Find the EOQ and cycle time.

15. Following table gives the operation cost, maintenance cost and salvage value at the end of every year of a machine whose purchase value is Rs.12,000. Find the economic life of the machine by assuming the interest rate as 15%.

End of year (n)	Operation cost at the end of year (Rs)	Maintenance cost at the end of year (Rs)	Salvage value at the end of year (Rs.)
1	2,000	2,500	8,000
2	3,000	3,000	7,000
3	4,000	3,500	6,000
4	5,000	4,000	5,000
5	6,000	4,500	4,000
6	7,000	5,000	3,000
7	8,000	5,500	2,000
8	9,000	6,000	1,000

16. Solve the following 3 × 5 game using dominance property

		Player B				
		1	2	3	4	5
Player A	1	6	15	30	21	6
	2	3	3	6	6	4
	3	12	12	24	36	3

PART C — (20 marks)

Compulsory.

17. Solve the following LP problem using Simplex method

Maximize $Z = 6X_1 + 4X_2$

Subject to

$2X_1 + 3X_2 \leq 30$

$3X_1 + 2X_2 \leq 24$

$X_1 + X_2 \geq 3$

X_1 and $X_2 \geq 0$

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