[06 – 4126]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

(Common with M.S. EEE)

Elective I — OPERATIONS RESEARCH

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Answer Questions No.1 and any FOUR from the rest.

All questions carry equal marks.

1. (a) Distinguish between a feasible solution, a basic feasible solution and an optimal solution of a LPP?

(b) The column vector [1,1,1] is a feasible solution to the system $x_1 + x_2 + 2x_3 = 4$; $2x_1 - x_2 + x_3 = 2$. Find a basic feasible solution.

(c) What is an unbalanced transportation problem? How do you proceed with such problems to solve them.

(d) Explain the differences between a transportation problem and an assignment problem.

(e) Distinguish between (i) Total float (ii) Independence float and (iii) Safety float used in PERT.

(f) What is meant by inventory? Explain the necessity for maintaining inventory.

(g) Distinguish between a Pure strategy and mixed strategy of a rectangular game. What is meant by an optimal strategy?

2. (a) A firm manufactures products A and B on which the profits earned per unit are Rs. 3 and Rs. 4 respectively. each Product is processed on two machines M_1 and M_2. Product A requires one minute of processing time on M_1 and two minutes on M_2 while B requires one minute on M_1 and one minute on M_2. Machine M_1 is available for not more than 7 hours 30 minutes while M_2 is available for 10 hours during a working day. Using graphical method, find the number of units of Products A and B to be manufactured to get maximum Profit.

(b) Solve the following LPP by simplex method.

Maximize $Z = 16x_1 + 15x_2$

Subject to $40x_1 + 31x_2 \leq 124$

$$\begin{aligned} -x_1 + x_2 &\leq 1 \\ x_1 &\leq 3 \end{aligned}$$

and $x_1, x_2 \geq 0$.

3. (a) What is meant by degeneracy in LPP? Explain how you will resolve this problem, if it arises in solving a LPP.

(b) Solve the following LPP using the Big–M method.

Minimize $Z = 4x_1 + x_2$

Subject to: $3x_1 + x_2 = 3$

$$\begin{aligned} 4x_1 + 3x_2 &\geq 6 \\ x_1 + 2x_2 &\leq 4 \end{aligned}$$

and $x_1, x_2 \geq 0$.

4. Obtain an optimal solution to the following transportation problem, with the basic feasible solution obtained by the North–West corner rule method.

		To				
		D_1	D_2	D_3	D_4	Supply
	O_1	10	2	20	11	15
From	O_2	12	7	9	20	25
	O_3	4	14	16	18	10
Demand		5	15	15	15	

5. Interpret the assignment problem as a LP model. Describe a method of drawing the minimum number of lines, in the context of solving an assignment problem.

Solve the following assignment problem to find the maximum total expected sales:

		Area			
		I	II	III	IV
Salesman	A	42	35	28	21
	B	30	25	20	15
	C	36	25	12	18
	D	24	20	16	12

6. What is a credited path? What is its importance in scheduling and controlling large projects? Can a critical path change during the course of a project? Consider the following project:

Activity	Time estimates (in weeks)			Predecessors
	a	m	b	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1.	5	15	E

(a) Draw the Project network

(b) Find the critical path and its standard deviation.

(c) Find the probability that the project is completed by 18 weeks.

7. Derive an "Economic lot size formula" when demand is known and is uniform, Production is instantaneous, lead time is zero and shortages are not permitted.

An aircraft company uses rivets at a rate of 2,500 Kg. per year. The rivets cost Rs. 30 per Kg, and the company estimates that it costs Rs. 130 to place on order. If the inventory carrying cost is 10% per year, how frequently the order for rivets be placed and what quantity should be ordered?

8. Explain the Maximin – Minimax Principle used in game theory for the selection of optional strategies by the two players.

Solve the following rectangular game using the method of dominance.

	B_1	B_2	B_3	B_4
A_1	5	−10	9	0
A_2	6	7	8	1
A_3	8	7	15	1
A_4	3	4	−1	4