SYAF. Q.M. II. 31/10/13

OP10AEG (L)

Time : 2.5 Hrs. **Marks : 75**

Instructions

1. **All questions are compulsory.**
2. **Only simple calculators are allowed.**
3. **Figures to the right indicate full marks.**

. (a)Name the following (any 8 out of 10) **(8)**

1. Transportation problem where Total Supply ≠ Total demand.
2. A quantitative method used for finding optimum assignments of jobs to the workers.
3. Routes in transportation problem which can't be used for transportation due to some practical reasons.
4. Decision making problem where probabilities of different states of nature can be Predicted using past data.
5. Method of finding initial solution of transportation problem without considering costs of transportation .
6. Form of Linear Program problem **(LPP)**where constraints are expressed as equations.
7. Diagrammatical presentation of decision making problem.
8. Constraint in LPP in graphical method which does not affect Common feasible region.
9. Full form of VAM in transportation problem.
10. Solution of graphical method of LPP when there is no common feasible region .

(b)Say true or false (any 7 out of 10) **(7)**

1. Least cost method generally gives less cost than that of using North-West corner rule.
2. If artificial variable is present in the final simplex table, LPP is said to have infeasible solution
3. **EVPI is E**xpected Variable Profit Information..
4. Maximin criterion uses optimistic approach.
5. Artificial variable is added to less than type constraint.
6. Regret matrix is found to convert maximization matrix into minimization matrix.
7. Laplace criteria uses coefficient of determinationα.
8. When common feasible region is not bounded by upper boundaries it is called as Infeasible solution
9. Objective function is the total of contributions of all the decision variables in LPP.
10. Cost per unit of transportation is the highest for restricted route in transportation problem.

OP10AEG

Q2 (a) Solve following LPP by simplex method . **(7)**

Maximize $Z = 40X_1 + 50X_2$

Subject to

$$3X_1 + X_2 \leq 9$$
$$X_1 + 2X_2 \leq 8$$
$$X_1, X_2 \geq 0$$

(b)A factory manufacture two products P and Q .The products need machine time and labor time for processing. Availability of machine hours and labor hours (per week) is 150 and 140 respectively. The time required for one unit of P and Q is given below

	Time(in hrs)	
Product	Machinc	Labor
P	3	4
Q	5	7

Per unit profits of the products P & Q are Rs 20 & Rs 35 respectively

Market survey indicates that minimum 10 units of product P have to be manufactured. Formulate the problem as LPP and solve it graphically. **(8)**

(OR)

Q2 . (p) Solve following LPP by graphical method **(7)**

Maximize $Z = 2X_1 + 4X_2$

Subject to

$$3X_1 + 6X_2 \geq 30$$
$$X_1 + X_2 \leq 14$$
$$4X_1 + 2X_2 \leq 40$$
$$X_1, X_2 \geq 0$$

(q) Solve following LPP by simplex method

Maximize $Z = 30X_1 + 30X_2$

Subject to

$$3X_1 + X_2 \leq 30$$
$$X_1 \leq 6$$
$$X_2 \leq 12$$
$$X_1, X_2 \geq 0$$

(8)

OP10AEG

Q 3 (a) A company has 4 machines t do jobs. Each job can b assigned to one machine only. The cost of assigning the jobs are given below

Costs (in Rs.)

	Machines			
Jobs	M1	M2	M3	M4
J1	51	77	49	55
J2	32	34	59	68
J3	37	44	70	54
J4	55	55	58	55

Find an optimum assignment which will minimize the total cost **(7)**

(b) There are three plants P1,P2 and P3 with supply capacities of 1200,800 and 1000 units. They supply to four warehouses A,B,C,D with demand of 600, 500,1400 and 500 units . Find initial solutions of the transportation problem using North-West corner method and Least Cost method. Also find total costs. **(8)**

Cost per unit (in Rs.)

	Warehouse			
Plants	A	B	C	D
P1	4	5	2	5
P2	3	8	4	8
P3	7	4	7	4

OR

Q3 . (p) A company solicits bids(tenders) on Each of the following 4 projects. From 5 contractors .The bids (or tenders) received are given below. Contractor D is unable to do job J3. Therefore submits no bid.

Bid costs(in '000 Rs.)

Projects \ Contractor	A	B	C	D	E
J1	18	25	22	26	25
J2	26	29	26	27	24
J3	28	31	30	--	31
J4	26	28	27	26	19

Find optimum assignment of the projects to the contractor so that total bid amount is minimized. **(7)**

(q) A firm has 3 plants from where material is to be transported to 4 markets. The transportation cost per unit are as below

OP10AEG

Cost per unit (in Rs.)

Plants\ WH	W1	W2	W3	W4	Supply
F1	17	28	15	8	160
F2	68	14	38	58	120
F3	38	6	68	18	170
demand	100	120	80	120	

Find optimum transportation schedule. **(8)**

Q(4)(a) Following pay off matrix is available for the company for their strategies under various states of nature N1,N2,N,N4. **(7)**

Pay-off (in Rs.)

	S1	S2	S3	S4
N1	500	420	340	260
N2	500	560	440	500
N3	500	520	360	520
N4	500	520	540	560

Find the optimum strategy using

(i) Maximax , (ii) Maximin (iii) Laplace (iv) Hurwtz's alpha ($\alpha = 0.7$)

(v) Minimax Regret criterion.

(b) A watch manufacturing unit is considering three important strategies to improve sales as- Outsourcing some activities(S1), Buying new machines(S2) , and Find new markets(S3) But the correct choice may depend upon the demand conditions as Low, Medium or High .By past experience, the probabilities of the three demand states are 0.1,0.5 and 0.4 respectively. The resulting pay-off matrix is given as **(8)**

Pay off (in '00 Rs.)

Alternative	Demand situations		
	Low	Medium	High
S1	10	50	50
S2	50	60	100
S3	-150	20	200

Construct a Decision tree based on above information and find the best strategy using EMV.

OR

OP10AEG

Q(4) (p) A bakery owner wants to decide the stock levels of cakes for the next month. The possible stock levels can be 25,30,35,40 and 50. The sale of the cakes depends on the demand levels of the cakes which again can be classified as 25,30,35,40and 50 with estimated probabilities 0.1,0.3,0.3,0.2 and 0.1 respectively .Following pay –off matrix is available. **(7)**

Pay – Off (in Rs.).

Demand levels

Stock	25	30	35	40	50
25	50	40	30	20	20
30	50	52	42	32	55
35	50	60	65	40	50
40	40	70	80	50	50
50	50	40	60	70	70

Find the optimum stock level using EMV. Also find EPPI and EVPI.

(q) For the following pay-off table giving payoff table for the 4 strategies of the company to handle 4 states of nature which are states of economy such as Fair ,Good, Average and Excellent , Find the optimum strategy using (i)Maximin(ii)Maximax(iii)Laplace and (iv)Minimax Regret **(8)**

Pay off(in Rs.'00)

strategy

Economy states	S1	S2	S3	S4
Fair	40	40	30	20
Good	80	50	20	60
Average	10	60	65	40
excellent	40	70	80	100

Q(5)(a) A company has 3 plants and 4 warehouses . On the basis of past experience, following transportation schedule is decided. Based on the following table , answer the questions below **(7)**

Costs per unit (in Rs.)

Plants\ WH	C1	C2	C3	C4	Supply
P1	10	8 (350)	7 (150)	12	500
P2	12	13	6 (300)	10 (300)	600
P3	8 (700)	10 (200)	12	14	900
Demand	700	550	450	300	

OPIOAEG

1. Is the solution feasible?
2. Is the solution degenerate ? why?
3. Is it the optimum solution? Why?
4. Find optimum total transportation cost.
5. Does alternate solution exist?

(b))(a) Solve following LPP by simplex method

Minimize $Z = 4X_1 + 2X_2$ **(8)**

Subject to

$$3X_1 + 4X_2 \geq 20$$
$$X_1 + 5X_2 \geq 15$$
$$X_1, X_2 \geq 0$$

OR

Q5(p) Apex Corp. has four plants in which 4 products are manufactured such as A,B,C,D. The production cost differ from the sales revenue. Following tables gives sales revenues and production costs of the 4 products. **(7)**

Sales Revenue (Rs. '000)

Products

Plants	A	B	C	D
P1	50	68	49	62
P2	60	70	51	74
P3	55	67	53	70
P4	58	65	54	69

Costs (Rs. '000)

Products

Plants	A	B	C	D
P1	49	60	45	61
P2	49	63	45	69
P3	52	62	49	68
P4	55	64	48	6

Construct profit matrix and find optimum assignments of the products to the plants.

(q) A retailer can keep stock levels of 10,20,30 or 40units.Only one stock level can be maintained . Demand levels can be 10,20,30,and 40 units. with respective probabilities 0.2,0.2.0.3,0.3. Purchase cost of 1 unit is Rs. 50 and its selling price is Rs.80 per unit. Unsold quantity can be sold at scrap value of Rs. 25 per unit.

Prepare pay-off table and decide the optimum stock level using EMV. **(8)**
