U N I T – I

I : **SHORT ANSWER TYPE QUESTIONS :-** (150 words)

Q. 1 : What do you mean by Operations Research? Explain its features.

Q. 2 : Explain scope of Operation Research.

Q. 3 : Discuss the steps involved in the process of Decision Making.

Q. 4 : What is Decision Making under uncertainty? What are the Assumption in Decision Making under uncertainty?

Q. 5 : Write notes on :-
   (A) Minimization of Maximum Loss
   (B) Maximization of Minimum gain
   (C) Rational Decision Making

II : **LONG ANSWER TYPE QUESTIONS :-**

Q. 1 : If you make a unit product and it is sold, you gain Rs. 5, if you make a unit and it is not sold, you lose Rs. 3. Suppose the probability distribution of the number of units demanded is as follows :-

No. of Units Demanded	0	1	2	3	4	5
Probability	0.20	0.20	0.25	0.30	0.05	0

How many units should you make?

Q. 2 A Retailer has to decide as to the optimum number of units to be stocked of a certain item under the following conditions:-
   (A) Cost price in season Rs. 12
   (B) Selling price in season Rs. 18
   (C) Bargain price offer the season Rs. 9
   (D) Cost of holding an item bey and the season Rs. 1
   (E) The probability distribution of demand based an post data is as follows :-

Units Demanded	7	8	9	10	11
Probability	0.20	0.20	0.25	0.15	0.20

Q. 3 : Daily demand (x) for pieces of bread at a grocery store is given by the following probability distribution :-

Daily Demanded (x)	100	150	200	250	300
Probability	0.20	0.25	0.30	0.15	0.10

If a piece of bread is not sold at the same day, it can be disposed of at 15 paise per piece at the end of the day otherwise the price of a fresh piece is 49 paise. The cost per piece of the store is 25 paise. If the optimum level of stocking is 200 pieces of bread daily, then find.
   (A) Expected monetary value (EMV) of this optimum stock level.
   (B) Expected value of perfect information (EVPI)

Q. 4 : From the following pay off table. The decision maker may choose any one of the following :-
   (A) Maximin (B) Maximax (C) Minimax Regret

PAY-OFF TABLE

| Supply | Demand (D) | D_1 | D_2 | D_3 | D_4 |
		20	21	22	23
S_1	20	40	40	40	40
S_2	21	36	42	42	42
S_3	22	32	38	44	44
S_4	23	28	34	40	46

Q. 5 : A Company is currently working with a process, which, after paying for materials, labour etc. brings a profit of Rs. 12,000. The Company has the following alternatives :-
(A) The Company can conduct research R1. Which is expected to cost Rs. 10,000 and having 90% probability of success. If successful, the gross income will be Rs. 26,000.
(B) The Company can conduct research R2, expected to cost Rs. 6,000 and having a probability of 60% success. If successful, the gross income will be Rs. 24,000.
(C) The Company can pay Rs. 5,000 as royalty of a new process which will bring a gross income of Rs. 20,000. Because of limited resources only one of the two types of research can be carried out at a time. Draw the decision tree and find the optimal strategy for the Company.

U N I T – II

I : SHORT ANSWER TYPE QUESTIONS :- (150 words)
Q. 1 : Discuss briefly the Application of Linear Programme in various functional areas of Management.
Q. 2 : Discuss briefly the steps to formulate a Linear Programming Problem? Explain with an example.
Q. 3 : The Manager of an Oil Refinery must decide on the optimal mix of 2 possible blending processes of which the impact and outputs per production run are as follows :-

Process	Input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	6	3	6	9
2	5	6	5	5

The maximum availability crude A & B are 250 units and 200 units respectively. The market requirement shows that at least 150 units of gasoline X and 130 units of gasoline Y must be produced. The profits per production run from process 1 and 2 are Rs. 40 and Rs. 50 respectively. Formulate the problem for maximizing the profits.

Q. 4 : What do you understand by an assignment problem? Give the brief outline of solving it.
Q. 5 : What is a General Transportation Problem? Explain with an example step by step solution of a Transportation problem.

II : LONG ANSWER TYPE QUESTIONS :-
Q. 1 : Solve the following problem by simplex method
Min $z = 3x_1 + 2x_2 + x_3$ subject to.
$x_1 + 4x_2 + 3x_3 \quad 50$
$2x_1 + x_2 + x_3 \quad 30$
$- \ 3x_1 - 2x_2 - x_3 \quad - 40$

$$x_1, x_2, x_3 \quad 0$$

Q. 2 : Solve the following problem by simplex method

$$\text{Max } z = 2x_1 + 3x_2 + 4x_3 \text{ subject to.}$$
$$3x_1 + x_2 + 4x_3 \quad 600$$
$$2x_1 + 4x_2 + 2x_3 \quad 480$$
$$2x_1 + 3x_2 + 3x_3 = 540$$
$$x_1, x_2, x_3 \quad 0$$

Q. 3 : Solve Graphically.

$$\text{Max } z = 300x_1 + 400x_2$$
$$5x_1 + 4x_2 \quad 200$$
$$3x_1 + 5x_2 \quad 480$$
$$5x_1 + 4x_2 \quad 540$$
$$8x_1 + 4x_2 \quad 80$$
$$x_1, \text{ \& } x_2 \quad 0$$

Q. 4 : A Company is producing a single product and is selling it through five agencies situated in different cities. All of a sudden, there is a demand for the product in another five cities not having any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the products to needy cities in such a way that the total traveling distance is minimized. The distance between the surplus and deficit cities in (k.m.) is given below :-

DEFICIT CITIES

		A_1	B_1	C_1	D_1	E_1
	A	10	5	9	18	11
	B	13	19	6	12	14
Surplus	C	3	2	4	4	5
Cities	D	18	9	12	17	15
	E	11	6	14	19	10

Determine the optimum assignment schedule.

Q. 5 : Solve the following by NWCM and test its optimality by stepping stone method or Modi method. The shipping costs are given in the table.

| | | PROJECT | | | SUPPLY |

From	To	A	B	C	
	w	4	8	8	56
Plant	x	16	24	16	82
	Y	8	16	24	77
Demand		72	102	41	215

U N I T – III

I : **SHORT ANSWER TYPE QUESTIONS :-** (150 words)

Q. 1 : What is Game Theory? What are the Properties of a Game? Explain the best Strategy.

Q. 2 : What is Saddle Point? How do you calculate it?

Q. 3 : Explain the Graphical Method of solving 2Xn or MX2 Games.

Q. 4 : What is Sequencing Problem? Give its essential characteristics?

Q. 5 : Explain the method of Processing n jobs 3 Machines.

II : **LONG ANSWER TYPE QUESTIONS :-**

Q. 1 : We have seven jobs each of which has to go through the machines M_1 and M_2 in the order M1 M2. Processing time (In hours) are given.

Job	1	2	3	4	5	6	7
Machine M_1	3	12	15	6	10	11	9
Machine M_2	8	10	10	6	12	1	3

Determine a sequence of three jobs that will minimize the total elapsed time & total Idle time

Q. 2 : Provide the Optimal Job Sequence for three Machines M_1, M_2 & M_3 for the following :-

Job	J_1	J_2	J_3	J_4	J_5
M_1	7	12	11	9	8
M_2	8	9	5	6	7
M_3	11	13	9	10	14

Q. 3 : Solve the following Games :-

PLAYER Q

		I	II	III	IV
	I	6	4	8	0
Player P	II	6	8	4	8
	III	8	4	8	0
	IV	0	8	0	16

Q. 4 : Solve the following Game Graphically. Payoff matrix for Player A as given :-

	a_1	a_2	a_3	a_4
b_1	-7	7	- 4	8
b_2	6	- 4	- 2	- 6

Q. 5 : Solve the following (2x4) Game Graphically :-

B

		I	II	III	IV
A	I	2	2	3	- 1
	II	4	3	2	6

U N I T – IV

I : **SHORT ANSWER TYPE QUESTIONS :-**   (150 words)

Q. 1 : Differentiate between PERT and CPM.
Q. 2 : Explain the following terms.
    (A)   Earliest Starting time   (B)   Latest Starting time
    (C)   Earliest Finishing time   (D)   Latest Finishing time
Q. 3 : What is Replacement? Describe some important Replacement Situations and Replacement Policies.
Q. 4 : Explain various types of Replacement Models.
Q. 5 : What is the Waiting Line Problem? What are the Components in a Waiting Line System?

II : **LONG ANSWER TYPE QUESTIONS :-**

Q. 1 : A Company distribute its products by trucks loaded at its only loading station. Both, company's trucks and contractor's trucks are used for this purpose. It was found out that on an average every five minutes, one truck arrived and the average loading time was three minutes 50% of the trucks belong to the contractor. Find out :-

    (A)   The probability that a truck has to wait.

    (B)   The waiting time of truck that waits.

    (C)   The expected waiting time of contractor trucks per day assuming a 24 hrs shift

Q. 2 : Customers arrive at the first class ticket counter of a theater at a rate of 12 per hour. There is one clerk service the customer at rate of 30 per hour.

    (A)   What is the Probability that there is no customer in counter (Idle system).

    (B)   What is the Probability that there are more than 2 customers in the counter.

    (C)   What is the Probability that there is no customer waiting to be served.

    (D)   What is the Probability that a customer is being served and nobody is waiting.

Q. 3 : Characteristics of a project schedule are given below :-

ACTIVITY		ACTIVITY TIMES		
Tot. Event I	Head Event J	Optimistic Time (to)	Pessimistic Time (tp)	Most Likely Time (tm)
1	2	1	3	2
2	3	1	7	4
2	7	2	4	3
3	4	1	5	3
3	5	0	0	0
4	6	0	0	0
5	6	3	13	5
7	8	4	12	8
6	9	4	14	6
8	9	1	3	2

Determine :-

    (A)   Expected activity times.

    (B)   Earliest expected and Latest expected time for each event.

    (C)   Draw a Network and indicate the Critical Path on it.

    (D)   Determine scheduling of activities & compute various floats.

Q. 4 : The Maintenance Cost and Resale Value per year of a machine whose purchase price is Rs. 7000 is given below :-

Year	1	2	3	4	5	6	7	8
Operation Cost	900	1200	1400	2100	2800	3700	4700	5900
Resale Values (Rs.)	4000	2000	1200	600	500	400	400	400

When should the Machine be replace.

Q. 5 : Following Mortality rates have been observed for a certain types of fuses.

Week	1	2	3	4	5
% Failing by the end of week	5	15	35	75	100

There are 1000 fuses in use and it costs Rs. 5 to replace on individual fuse. If all fuse were replaced simultaneously it would cost Rs. 1.25 per fuse. At what intervals the group replacement should be done? Which policy is better.

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