Shri Shankaracharya Institute of Professional Management & Technology
DEPARTMENT OF MANAGEMENT STUDIES
ASSIGNMENT QUESTIONS
OPTIMIZATION METHODS 576311(76)

Unit – 1

Q1. Max $Z = x_1 + x_2 + 3x_3$

Subject to constraint

$$3x_1 + 2x_2 + x_3 \leq 3$$
$$2x_1 + x_2 + 2x_3 \leq 2$$
$$x_1, x_2, x_3 \geq 0$$

Q2. Min $Z = 40x_1 + 24x_2$

Subject to constraint

$$20x_1 + 50x_2 \geq 4800$$
$$80x_1 + 50x_2 \geq 7200$$
$$x_1, x_2 \geq 0$$

Q3. Max $Z = 3x_1 + 2x_2$

Subject to constraint

$$2x_1 + x_2 \leq 2$$
$$3x_1 + 4x_2 \geq 12$$
$$x_1, x_2 \geq 0$$

Q4. Max $Z = 3x_1 - x_2 + x_3$

Subject to constraint

$$4x_1 - x_2 \leq 8$$
$$8x_1 + x_2 + 3x_3 \geq 12$$
$$5x_1 - 6x_3 \leq 13$$
$$x_1, x_2, x_3 \geq 0$$

Unit – 2

Q1. Find out the optimal solution of a given transportation problem.

	D1	D2	D3	D4	Supply
O1	21	16	24	19	11
O2	17	18	24	23	13
O3	32	17	18	41	19
Requirement	6	10	12	15	43

Q2. Priyanshu enterprise has three factories at locations A, B and C which supplies three warehouse located at D, E and F. Monthly factory capacities are 10, 80 and 15 units respectively. Monthly warehouse requirements are 75, 20 and 50 respectively. Unit shipping cost (in Rs) are given here.

	Warehouse		
Factory	D	E	F
A	5	1	7
B	6	4	6
C	3	2	5

The penalty cost for not satisfying demand at the warehouses D, E and F are Rs. 5, Rs. 3, and Rs. 2, per unit respectively. Determine the optimal distributor for priyanshu, using any of the known algorithm.

Q3. A company has three plants at locations A, B and C which produce the same product. It has to supply this to buyers located at D, E and F. The weekly plant capacities for A, B and C are 100, 800 and 150 units respectively. While the buyer requirements are 750, 200 and 500 units respectively for D, E and F. The unit shipping cost (in Rs) are given here.

	Buyer		
Plant	D	E	F
A	8	4	10
B	9	7	9
C	6	5	8

Assume that the penalty for failing to supply buyer requirement is Rs. 4, Rs. 3 and Rs. 3 per unit in respect of D, E and F respectively.

Determine the optimal distribution for the company so as to minimize the cost of transportation and penalty payable.

Q4. A company receives a particular component required for its production from two suppliers A and B. It has production plant at three locations X, Y and Z. Due to non availability of proper roads, the plant Y cannot receive the material from supplier A. Similarly plant X cannot received material from supplier B. The weekly requirements of the plants and weekly availability of supply from A and B along with the respective per unit cost of transportation is given below.

	X	Y	Z	Availability
A	9	–	5	45
B	–	7	6	35
Requirement	50	25	25	

Unit – 3

Q1. A solicitors firm employs typists on hourly piece rate basis for their work. There are five typists and their charges and speeds are different. According to an earlier understanding only one job is given to one typist and the typist is paid for full hour even if he works for a fraction of an hour. Find the least cost allocation for the following data:

Typist	Rate/Hour (Rs.)	No. of pages typed / hour
A	5	12
B	6	14
C	3	8
D	4	10
E	4	11

Job	Number of pages
P	199
Q	175
R	145
S	298
T	178

Q2. A firm marketing a product has four salesman S_1, S_2, S_3 and S_4. There are three customers C_1, C_2 and C_3. The probability of making a sale to a customer depend upon the salesman customer support. The table below represents the probability with which each of the salesman can sell to each of the customers:

Q4. A firm produces four products. There are four operators who are capable of producing each of them. The processing time varies from operator to operator. The firm works 8 hours a day and allows 30 minutes for lunch. The processing time in minutes and profits of each of the product are given below:

Operators	Products			
	A	B	C	D
1	15	9	10	6
2	10	6	9	6
3	25	15	15	9
4	15	9	10	10
Profit (Rs./unit)	8	6	5	4

Unit – 4

Q1. 7 jobs are required to be processed through 2 machines A and B. The processing time in (hours) of each jobs on the 2 machines are given below.

Job	Processing Time (Hours)	
	Machine A	Machine B
1	10	5
2	20	21
3	5	4
4	25	15
5	15	14
6	12	12
7	6	9

		Salesman			
		S_1	S_2	S_3	S_4
Customers	C_1	0.70	0.40	0.50	0.80
	C_2	0.50	0.80	0.60	0.70
	C_3	0.30	0.90	0.60	0.20

If only one salesman is to be assigned to one customer, what combination of salesmen and customers shall be optimal? Profit obtained by selling one unit to C_1 is Rs. 500,to C_2 is Rs. 450 and to C_3 is Rs.540. what is the total expected profit?

Q3. Weldon company has taken the third floor of a multi storeyed building for rent with a view to locate one of their zonal offices. There are five main rooms at this floor to be assigned to five mangers. Each room has its own advantages and disadvantages. Some have windows, some are closer to the washrooms or to the canteen or secretarial pool. The rooms are all of different sizes and shapes. Each of the five managers were asked to rank their room preferences amongst the rooms 301, 302, 303, 304 and 305.

Their preferences were recorded in a table as indicated below.

Managers				
M1	M2	M3	M4	M5
302	302	303	302	301
303	304	301	305	302
305	305	304	304	304
	201	305	303	
		302		

Most of the managers did not list all the five rooms since they were not satisfied with some of these rooms and they left off these rooms and they left off these from the list. Assuming that their preferences can be quantified by numbers, find out as to which manager should be assigned to which room so that their total preference ranking is minimum.

Unit – 5

Q1. A project schedule has the following characteristics:

Activity	Duration
1 – 2	15
1 – 3	15
2 – 3	3
2 – 5	5
3 – 4	8
3 – 6	12
4 – 5	1
4 – 6	14
5 – 6	3
6 – 7	14

From the above information you are required to calculate.

(a) Construct the network diagram.

(b) Compute the critical path.

Q2. A small project consist of seven activities for which the relevant data is given below:

Activities	Preceding Activity	Duration
A	----	4
B	----	7
C	----	6
D	A, B	5
E	A, B	7
F	C,D,E	6
G	C,D, E	5

Q2. Find the sequence that minimizes the total elapsed time required to complete the following tas

Task	Machine A	Machine B	Machine C
A	3	4	6
B	8	3	7
C	7	2	5
D	4	5	11
E	9	1	5
F	8	4	6
G	7	3	12

Q3. A company distributed its product by trucks loaded at its only loading station. Both the company truck and the contractor trucks are used for this purpose. It was found that on an average truck arrived every 5 minutes and the average unloading time was 3 minutes. 50% trucks belong to the contactor. 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 the contractor per day, assuming a 24 hours shift day.

Q4. A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 hour-work day. If the type writer is valued at Rs. 1.50 per hour, determine.

a. Equipment utilization.
b. The per cent time that an arriving letter has to wait.
c. Average system time.
d. Average cost due to waiting on the part of typewriter i.e it remain idle.

Activity	t_o	t_m	t_p	Preceding Activity
A	3	6	9	----
B	2	5	8	----
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

Find the path and standard deviation, also find the probability of completing the project in 18 weeks.