

PGDORM
SEMESTER – I
ASSIGNMENTS
Academic Year 2020-21

Please follow the instructions and submit the assignment in the given time.

1. Assignment is compulsory.
2. Last date to submit this assignment is 20th July, 2021.
3. Assignment should be in written format. You can write the assignment in the Assignment sheet that you received from the Institute or can use single line A4 size papers.
4. No typed assignments or Xeroxed copies will be accepted.
5. Mention your details on the front page:
 - a) Full Name
 - b) Application ID No. / Seat No.
 - c) Name of the Subject
6. Do not forget to write the page number on each and every page at the top right hand side of the page.
7. Scan and submit the assignment in PDF format on our official MOODLE platform (eclipse.mu.ac.in).

BASIC STATISTICS

(MARKS: 20)

1) Calculate Median, Mean, Mode, 7th Decile, 35th Percentile

(04 Marks)

Weekly wages	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	100-110
frequency	15	19	25	23	21	22	15

2) Draw histogram & hence, find mode.

(04 Marks)

Marks	65 - 70	70 - 75	75 - 80	80 - 85	85 - 90	90 - 95	95 - 100
Number of candidates	2	10	10	25	20	18	15

3) Calculate Karl Pearson's correlation coefficient

(04 Marks)

AGE IN YEARS (X)	40	45	50	55	60	65	70	75
BLOOD PRESSURE (Y)	15	30	30	35	35	50	60	60

4) Find the regression of profit per unit on output from the following data.

(04 Marks)

OUTPUT (1000 TONS) X	15	17	19	21	23	25	27
PROFIT PER UNIT (100 UNITS) Y	27	37	38	45	47	55	65

Q5) SOLVE

(04 Marks)

a) A bag contains 5 white & 7 black balls. Find the probability of drawing i) 3 white ball ii) 2 white & 1 black ball.

b) There are 40 tickets numbered 1 to 40. One ticket is drawn at random, what is the probability that the number on the ticket drawn is divisible by i) 3 or 5 ii) 3 or 7.

OPTIMIZATION MODELS 1

(MARKS: 20)

(05 Marks)

Q.1. Rajeshwar Engineering Works at Patna has been given a contract to make seven components by Indian Railways. Each of these components requires processing on two machines M1 and M2 in the order M1, M2. The time (in hours) required by each of these jobs for processing on the two machines is given in the table below. Find the optimal sequence for processing the seven jobs. Also find out the job waiting time and machine idle time.

	Jobs	A	B	C	D	E	F	G
Processing Time (Hrs)	M1	9	5	8	3	4	1	7
	M2	2	4	10	5	6	11	6

Q.2. Prepare an ABC analysis of the following data

(05 Marks)

Sr. No.	Item	Unit Price(Rs.)	Consumption
1.	M.S. Plate	60/-	40,000
2.	S.S. Plate	110/-	10,000
3	Paint	50/-	8,000
4.	Brass Sheet	85/-	1,500
5.	Acetylene Gas	120/-	2,000
6.	Copper Rod	100/-	1,000

(05 Marks)

Q.3. Each unit of an item costs a company Rs. 40. Annual holding costs are: 18% of unit cost for interest charges, 1% for insurance charges, 2% allowances for obsolescence, Rs. 2 for building overheads, Rs. 1.50 for damage and loss, and Rs. 4 miscellaneous costs. The annual demand for the item is constant at 1,000 units. Placing each order costs, the company Rs. 100.

- Calculate EOQ and the total costs associated with stocking the item.
- If the supplier of the item will only deliver batches of 250 units, how are the stock holding costs affected?
- If the supplier relaxes his order size requirement, but the company has limited warehouse space and can stock a maximum of 100 units at any time, what would be the optimal ordering policy and associated costs?

OPTIMIZATION MODELS 1

(MARKS: 20)

(05 Marks)

Q.4. A retailer deals in a perishable commodity. The daily demand and supply are variables. The data for the past 500 days show the following demand and supply:

Supply		Demand	
Availability (kg.)	No. of days	Demand (kg.)	No. of days
10	40	10	50
20	50	20	110
30	190	30	200
40	150	40	100
50	70	50	40

The retailer buys the commodity at Rs.20 per kg and sells it at Rs.30 per kg. Any commodity remains at the end of the day, has no saleable value. Moreover, the loss (unearned profit) on any unsatisfied demand is Rs.8 per kg. Given the following pair of random numbers, simulate 6 days' sales, demand and profit.

(31, 18); (63, 84); (15, 79); (07, 32) (43, 75); (81, 27)

The first random number in the pair is for supply and the second random number is for demand viz. in the first pair (31, 18), use 31 to simulate supply and 18 to simulate demand.

APPLIED MATHEMATICS

(MARKS: 20)

NOTE: ATTEMPT ANY 5 QUESTIONS

- Q.1.** Solve the following equation by elimination method and cross- multiplication method.
 $5x + 3y = 3$, $4x - 7y = 30$
- Q.2.** Solve $\frac{(x^2 + 1)}{x^2} + \frac{(x + 1)}{x} = 4$
- Q.3.** Solve the equation $\sqrt{x^2 + 3x + 32} + \sqrt{x^2 + 3x + 5} = 9$
- Q.4.** Find the value of x if
$$\begin{vmatrix} 1 & 2 & 10 \\ 2 & x & 17 \\ -1 & 8 & 26 \end{vmatrix} = -6$$
- Q.5.** A person takes a loan on compound interest and returns it in 2 equal annual instalments. If the rate of interest is 16% p.a. and the yearly instalment is ₹ 1682, find the principle amount.
- Q.6.** If $y = x / (x+2)$, prove that $x (dy)/(dx) = (1-y)y$
- Q.7.** Find local maxima and minima of $f(x) = x^3 - 2x^2 - 4x - 1$
- Q.8.** Evaluate $\int x^2 e^{3x} dx$

LINEAR PROGRAMMING

(MARKS: 20)

(04 Marks)

- 1) Agashe & Co. plans to reach target audiences belonging to two different monthly income groups, the first with incomes greater than Rs. 15,000 and the second with income of less than Rs. 15,000. The total advertising budget is Rs. 2,00,000. Advertising on TV costs Rs. 50,000 for one program, whereas advertising on Radio costs Rs. 20,000 for one program. For contract reasons at least 3 programmes must be given on the TV and the No. of Radio programmes are limited to 5 only. One TV programme covers 4,50,000 audience belonging to income group having more than Rs. 15000 monthly income where as it reaches to 50,000 audiences belonging to below Rs. 15000 monthly income group. Similarly, one radio program reaches to 20,000 and 80,000 audiences belonging to above Rs. 15,000 and below 15,000 monthly income groups respectively. Formulate the linear programming problem and using graphical method determine the media mix so as to maximize the total number of target audience. Comment on the solution.

(04 Marks)

- 2) M/s Raj and Bilimoria Associates produce these items 'X', 'Y' and 'Z' each of which have to be processed through three machines 'P', 'Q' and 'R'. each unit of the product 'X' requires 3,4 and 2 hours on machines 'P', 'Q' and 'R' respectively. Similarly, each unit of product 'Y' requires 5,4 and 4 hours on machine 'P', 'Q' and 'R' respectively, whereas for product 'Z' these requirements are 2,4 and 5 hours on these three machines P, Q and R. Every day 60 hours are available on machine P, 72 hours on machine 'Q' and 100 hours on machine 'R'. the unit contribution of these products 'X', 'Y' and 'Z' are Rs. 5 Rs. 10 and Rs 8 respectively.
- (a) Formulate the linear programming problem and using simplex method find the optimal solution for the product mix, also find the unused capacity of machines if any.
- (b) What would be the effect on the solution of each of the following:
- (i) Obtaining an order of 12 units of 'X' which has to be met.
- (ii) An increase of 20% in the capacity of machine 'P'

LINEAR PROGRAMMING

(MARKS: 20)

(04 Marks)

- 3) Mr. A.P. Ravi wants to invest Rs. 1,00,000 in two companies 'A' and 'B' so as not to exceed Rs. 75,000 in either of the company. The company 'A' assures average return of 10% whereas the average return of company 'B' is 20%. the risk factor rating of company 'A' is 4 on 0 to 10 scale whereas the risk factor rating for 'B' is 9 on similar scale. As Mr. Ravi wants to maximize his returns, he will not accept an average rate of return below 12% or a risk factor above 6. Formulate this as a Linear Programming Problem and solve it graphically.

(04 Marks)

- 4) Product A offers a profit of Rs. 25/- per unit and product B yields a profit of Rs. 40/- per unit. To manufacture the products – leather, wood and glue are required in the amount shown below:

Product	Resources required for one unit		
	Leather (in kg.)	Wood (in sq. Mts)	Glue (in lts.)
A	0.50	4	0.2
B	0.25	7	0.2

Available resources include 2200 kg. of leathers, 28000 sq. meters of wood and 1400 litres of glue :

- i) State the objective function and constraints on mathematical form.
- ii) Find the optimum solution.
- iii) Which resources are fully consumed? How much of each resources remains unitized?
- iv) What are the shadow prices of resources?

LINEAR PROGRAMMING

(MARKS: 20)

(04 Marks)

- 5) Standard Manufacturers produce three products P, Q and R which generate profits of Rs. 20/-, Rs.12/- and Rs. 8/- per unit. Three operations are needed for each product on three machines M_1 , M_2 and M_3 . The maximum working hours available for each of these three machines are 1200, 900 and 400 respectively. One of the Simplex method solutions is given in the following table:

C	X	B	20	12	8	0	0	0
			X_1	X_2	X_2	S_1	S_2	S_3
0	S_1	160	0	0	4/5	1	-4/5	4/5
12	X_2	120	0	1	3/5	0	2/5	-3/5
20	X_1	140	1	0	1/5	0	-1/5	4/5
Z			20	12	56/5	0	4/5	44/5
$\Delta = C-Z$			0	0	-16/5	0	-4/5	-44/5

On the basis of above table, answer the following questions:

- 1) Which Machine is not fully utilized? if the balance working hrs. of this machine are shifted to M_2 what will be the effect on the solution?
- 2) Retaining the optimality, find the range of working hrs. of the third machine.
- 3) Within what range of profit of each product, the solution will remain optimal?
- 4) Keeping the shadow Prices intact, find the range for the working hours of M_2 .
- 5) Without altering the optimality, is it possible to reduce the availability of the working hours of the M_2 to 200 hours?
- 6) If it is decided to increase the capacities of all three machines by 25% of their respective present capacity, what will be the new product mix?