M.Com. 1st Semester Examination, 2019

QUANTITATIVE TECHNIQUES FOR MANAGERIAL DECISIONS

PAPER – COM-103

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

Write the answers to questions of each Unit in separate books wherever necessary

UNIT – I

[*Marks* : 20]

1. Answer any *two* questions of the following :   2 × 2

(*a*) Explain the term 'surplus variable' in a L.P.P.

(*b*) What is Basic solution in a L.P.P. ?

(*Turn Over*)

(*c*) What is unbalanced assignment problem ?

(*d*) What is North West corner method in a transportation problem ?

2. Answer any *two* questions of the following : 4×2

(*a*) Obtain the dual of the following L.P.P.

$$\text{Min } z = 40 X_1 + 120 X_2$$
$$\text{subject to, } -X_1 + 2X_2 \geq -8$$
$$3X_1 + 5X_2 = 90$$
$$15X_1 + 44X_2 \leq 660$$

Provided that $X_1, X_2 \geq 0$.

(*b*) In a job shop operation, five jobs may be performed on any of four machines. The hours required for each job on each machine are presented in the following table :

Job \ Machine	1	2	3	4
A	13	14	16	10
B	12	13	15	12
C	11	12	12	9
D	16	16	18	14
E	10	12	13	12

The plant foreman would like to assign the jobs so that the total time is minimised. Find the optimal solution.

(c) In a textile sales emporium, four salesmen A, B, C and D are available to four counters W, X, Y and Z. Each salesman can handle any counter. The service (in hour) of each counter when manned by each salesman is given below :

Counter \ Salesman	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

How should the salesmen be allocated appropriate counters so as to minimise the service time ? Each salesman must handle only one counter.

(d) A diet for a sick person must contain at least 3,000 units of Vitamins, 40 units of Minerals

and 1,200 calories. Two foods P and Q are available at a cost of ₹ 10 and ₹ 8 per unit respectively. If one unit of P contains 200 units of vitamins, 2 units of Minerals and 50 calories and one unit of food Q contains 100 units vitamins, 4 units of minerals and 40 calories, find by using graphical method, what combination of foods be used to have least cost ?

3. Answer any *one* of the following questions : 8×1

   (*a*) Solve the following L.P.P. using simplex method : 8

   $$\text{Max } z = 3X_1 + 2X_2 + 3X_3$$
   $$\text{subject to, } 2X_1 + X_2 + X_3 \leq 2$$
   $$3X_1 + 4X_2 - 2X_3 \geq 8$$
   Provided that $X_1, X_2, X_3 \geq 0$.

   (*b*) ABC Enterprises is having three plants manufacturing dry cells, located at different locations, production cost differs from plant to plant. There are five sales offices of the company located at different regions of the country. The sales prices can differ from

region to region. The shipping cost from each plant to each sales office and other data are given in following table :

Production data table

Production cost per unit (₹)	Maximum capacity in number of units	Plant Number
20	150	A
22	200	B
18	125	C

Shipping cost table

	Sales Office-1	Sales Office-2	Sales Office-3	Sales Office-4	Sales Office-5
Plant A	1	1	4	9	4
Plant B	9	7	8	3	3
Plant C	4	5	3	2	7

Demand and sales prices table

	Sales Office-1	Sales Office-2	Sales Office-3	Sales Office-4	Sales Office-5
Demand (units)	80	100	75	45	125
Sales price(₹)	30	32	31	34	29

Find the initial feasible solution of the above transportation problem using Vogel's Approximation method.   8

UNIT – II

[*Marks* : 20]

4. Answer any *two* questions : 2×2

   (*a*) What do you mean by network analysis ?

   (*b*) Write the cost equation of 'Economic Lot Size with Uniform Demand' Model.

   (*c*) State the conditions of queueing problem.

   (*d*) What do you mean by Forward Pass and Backward Pass in Network Analysis ?

5. Answer any *two* questions : 4×2

   (*a*) Briefly explain the objectives of inventory management.

   (*b*) A project has the following activities :

Activity	Immediate Predecessors	Duration (weeks)
A	-	3
B	-	2
C	-	2
D	A	4
E	B	4
F	B	7
G	C	4
H	D	2
I	E	5
J	F, G	6
K	H, I	3

Required :

(i) Critical path and total project duration.

(ii) Compute earliest event time and latest event time.

(c) A TV repairman finds that the time spent on his job has an exponential distribution

with mean 30 minutes. If he repairs sets on FCFS basis and if the arrival of sets is with an average of 10 per 8 hour day, what is the repairman's expected idle time each day ? Also obtain the average number of sets in the system.

(*d*) Annual demand for an item is 6000 units. Ordering cost is Rs. 600 per order. Inventory carrying cost is 18% of the purchase price per unit. The price break is as follow :

Quantity	Price(Rs.)
$0 \leq Q_1 < 2000$	20
$2000 \leq Q_2 < 4000$	15
$4000 \leq Q_3$	9

Find the optimum order size.

6. Answer any *one* question from the following : 8×1

(*a*) The following data is pertaining to a project with normal time and crash time :   8

Jobs	Normal		Crash	
	Time	Cost	Time	Cost
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

(*i*) Find the costs of completing the project in the normal time and minimum time; (*ii*) What is the optimal duration and costs involved ?

(*b*) Write short notes on :   4 + 4

(*i*) Service discipline in queueing theory

(*ii*) Economic Order quantity.

[*Internal Assessment* — 10 Marks]

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