Post-Graduate Course

Term End Examination – 2006 Part-I

M. Com.

Quantitative Techniques

Paper - VIII

Time : Two Hours Full Marks : 50

(Weightage of Marks : 80%)

Special credit will be given for accuracy and relevance in the answer. Marks will be deducted for incorrect spelling, untidy work and illegible handwriting. The weightage for each question has been indicated in the margin.

Module I

Answer ***any two*** questions.

1.(a) Solve the following L.P.P graphically or otherwise

Maximize $z = 5x_1 + 4x_2$

Subject to

$$6x_1 + 4x_2 \leq 24$$
$$x_1 + 2x_2 \leq 6$$
$$-x_1 + x_2 \leq 1$$
$$x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

b) A marketing manager wishes to allocate his annual advertising budget of Rs. 2,00,000 to two media vehicles A and B. The unit cost of a message in media A is Rs. 1,000 and that of B is Rs. 1,500. Media A is a monthly magazine and not more than one insertion is desired in one issue, whereas atleast five messages should appear in media B.

The expected audience for unit messages in media A is 40,000 and that of media B is 55,000. Develop an LP model and solve it for maximizing the total effective audience. $5 + 7\frac{1}{2} = 12\frac{1}{2}$

2.(a) Solve the following L.P.P.

Minimize $C = 2x_1 + 7x_2$

subject to

$$\begin{bmatrix} 2 & 4 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \geq \begin{bmatrix} 16 \\ 6 \end{bmatrix}$$

$x_1 \; x_2 \geq 0$

(b) Find the dual of the following L.P.P.

Maximize $z = 4x_1 + x_2 + 7x_3$

Subject to $x_1 + x_2 + x_3 = 10$

$5x_1 - x_2 + x_3 \geq 12$

$x_1 + 7x_2 - 3x_2 = 4$ $8 + 4\frac{1}{2} = 12\frac{1}{2}$

3. A manufacturing company purchases raw materials and stores in warehouses located in the following cities

Location	**Capacities (tonnes)**
City A	90
City B	50
City C	80
City D	60

The company supplies manufactured goods to the retail stores in three cities that have the following demand

Stores	**Demand (tonnes)**
X	120
Y	100
Z	110

The following railroad shipping costs per tonne (in hundred rupees) have been determind

Warehouse location	Store X	Y	Z
A	30	10	5
B	12	9	4
C	7	3	11
D	9	5	7

Find the optimum distribution schedule that will minimize the transportation cost for the manufacturing compay. $12\frac{1}{2}$

4.a) Consider the following cost matrix related to the assignment of 4 operators to 4 machines.

		Machine 1	2	3	4
	1	1	4	6	3
Operator	**2**	9	7	10	9
	3	4	5	11	7
	4	8	7	8	5

i) Formulate the above assignment problem as a L. P. problem.

ii) Solve the above assignment problem using Hungarian method.

b) Solve the following game problem graphically.

Player B

Player A $\begin{bmatrix} 1 & 3 & -3 & 7 \\ 2 & 5 & 4 & -6 \end{bmatrix}$ $6+6\frac{1}{2}=12\frac{1}{2}$

Module II

Answer ***any two*** questions.

5) A project consists of eight activities with the following relevant information.

Activity	Immediate predecessor	Estimated duration (days) Optimistic	Most likely	Pessi-mistic
A	—	1	1	7
B	—	1	4	7
C	—	2	2	2
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

i) Draw the network and find out the expected project completion time.

ii) What duration will have 95% confidence of project completion ? $7\frac{1}{2}+5=12\frac{1}{2}$

6.a) Discuss different types of costs associated with the operations of an inventory system.

b) A contractor has to supply 20,000 units per day. He can produce 30,000 units per day. The cost of holding a unit in stock is Rs. 3·00 per year and the set up cost per run is Rs. 50·00. How frequently and of what size the production runs be made ? $6\frac{1}{2}+6=12\frac{1}{2}$

7. The annual demand of a product is 10,000 units. Each unit costs Rs. 100 if orders placed in quantities below 200 units but for orders of 200 or above the price is Rs. 95. The annual inventory holding costs is 10 percent of the value of the item and the ordering cost is Rs. 5 per order. Find the economic lot size. $12\frac{1}{2}$

8. Write short notes on (any ***two***)

   i) Mixed strategy game.

   ii) Degeneracy.

   iii) Aritificial variables in L. P.

   iv) Probabilistic inventory models.

   v) Crash cost in project scheduling. $6\frac{1}{4} \times 2 = 12\frac{1}{2}$