EASTERN UNIVERSITY, SRI LANKA
Faculty of Commerce and Management
Third Year First Semester Examination in BBA -2009/2010 (August 2011)
(Repeat)
MGT 302 Management Science

Answer all five questions **Time: 03 hours**

Q1. Four factories A, B, C and D are required to manufacture and supply a specific product for four stores P, Q, R and S. Production capacities in each factory and demand at each store are given in Table 1 below, while unit transportation cost in rupees from each factory to each store is given in Table 2.

Table 1

Factory	A	B	C	D
Production capacity (units)	50	70	30	50
Store	P	Q	R	S
Demand (units)	25	35	105	35

Table 2

Store		P	Q	R	S
Factory	A	2	4	8	11
	B	10	8	7	5
	C	13	3	9	12
	D	4	6	8	3

Required:

(a) Construct this as a standard transportation problem in tabular form.

(b) Using the least cost method find the initial solution.

(c) Check for optimality of the solution obtained in part (b) using MODI method.

(d) Has the optimal solution been obtained? If the answer is not improve it until the optimal solution is obtained. If the answer is yes, justify your answer.

(e) Evaluate the optimum transportation cost.

(20 Marks)

Q2.

(a) Drive the basic EOQ formula by using following parameters.

A = Annual demand

B = Order quantity

C = Cost of ordering for one order

H = Carrying cost for one item p.a.

(05 Marks)

(b) A company uses a special bracket in the manufacture of its products which it orders from outside suppliers. The appropriate data are given below:

Demand = 2000 per annum

Order cost = Rs. 20 per order

Carrying cost = 20% of item price

Basic item price = Rs.10 per bracket

The company is offered the following discounts on the basic price:

For order quantities	400-799	less 2%
	800-1599	less 4%
	1600 and over	less 5%

You are required to establish the most economical quantity to order by calculating following aspects.

(i) Calculate the EOQ using the basic price.

(05 Marks)

(ii) Compare the savings from the lower price and ordering costs and the extra stockholding costs at each discount point (i.e. 400, 800 and 1600) with the costs associated with the basic EOQ.

(10 Marks)

(Total 20 Marks)

Q3. Consider the following activities, associated normal time and cost, together with extra cost of saving a day on selected activities.

Activity	Preceding Activity	Normal cost of activity (in Rs.)	Normal Time (in Days)	Extra cost of reducing normal time by one day (in Rs.)
A	-	10,000	5	3,000
B	-	12,000	7	2,000
C	-	5,000	9	800
D	A,B	6,000	10	600
E	B,C	9,000	8	2,000
F	C	5,000	6	900
G	D,E	4,000	4	700
H	D	3,000	3	200
I	F,G,H	5,000	7	2,200
J	I	6,000	12	500

No single activity can be reduced by more than a day. In addition, fixed costs will be incurred at the rate of Rs, 800 for every day.

You are required to:

(a) Find critical paths, using normal times, the time taken and the total cost of completing the project.

(07 Marks)

(b) The shortest time in which the project can be completed and the associated cost.

(07 Marks)

(c) The lowest cost for which the project can be completed and associated time.

(06 Marks)

(Total 20 Marks)

(b)

Q4.

(a) Solve the following Linear Program by using the simplex method and interpret the results.

Maximize $6X_1 + 7X_2$

Subject to:

$$2X_1 + 3X_2 \leq 12 \quad \text{(i)}$$

$$2X_1 + X_2 \leq 08$$

$$X_1, X_2 \geq 0 \quad \text{(ii)}$$

Where X_1 = no. of units of product A

X_2 = no. of units of product B

6 = incremental profit per unit of product A

7 = incremental profit per unit of product B

(15 Mark

(b) You are given the following linear programming model.

Minimize Z = 3000a + 4000b + 8000c

Subject to:

$$4a + 2b \geq 12$$

$$4b + 8c \geq 16$$

$$a, b, c \geq 0$$

Covert the above model into a maximization model considering its duality.

(05 Mark

(Total 20 Mark

Q5.

(a) A company is faced with the problem of assigning 4 machines to 6 different jobs (one machin to one job only). The profit (in Rs) are estimated as follows:

Job	Machine			
	A	B	C	D
1	30	60	20	60
2	70	10	40	40
3	30	80	50	80
4	60	40	30	70
5	50	20	40	30
6	50	70	60	40

Required: Solve the problem to maximize the total profits.

(10 Marks)

(b) Management of the Toys Company needs to decide whether to introduce a certain new novelty toy for the upcoming new year season, after which it would be discontinued. The total cost required to produce and market this toy would be Rs 500,000.00 plus Rs.15.00 per toy produced. The company would receive revenue of Rs 35.00 for each toy sold.

(i) Assuming that every unit of this toy that is produced is sold, formulate a mathematical model for the profit in terms of number produce and sold.

(ii) Find out the break-even point that this number must exceed to make it worthwhile to introduce this toy.

(10 Marks)

(Total 20 Marks)