

Eastern University, Sri Lanka

EASTERN UNIVERSITY, SRI LANKA
Faculty of Commerce and Management
Special Examination for Final Year in Bachelor of Business
Administration 2005/2006
(March 2008)
MGT 3053 Management Science

Answer all five (5) questions

Time: 03 hours

Q1.

The operation manager of a manufacturing company requests the marketing manager to find out the relevant details about the existing markets in certain cities of Sri Lanka in order to improve the present set up.

After conducting a pilot study, the marketing manager obtains the following information:

The supplies of input

Supply site	A	B	C	D
Units per month	20,000	38,000	10,500	16,000

Demands at the markets are:

Demand center	P	Q	R	S	X	Y	Z	M
Units per month	5,000	10,000	2,500	18,000	1,000	22,000	24,000	3,500

Transportation cost is Rs. 0.05 per unit per k.m. The distances between the supply sites and demand centers are given in the following table (in k.m).

	P	Q	R	S	X	Y	Z	M
A	90	50	50	60	40	100	50	79
B	50	80	60	40	30	70	50	80
C	70	70	80	90	40	60	65	52
D	86	90	80	70	60	30	50	36

After consulting an expert and other executives of the company, the manager decides to select the demand centers Q, S, Y and Z and supply sites A, B, and D.

You are required to calculate the transportation plan which will minimise costs of the company. Calculate the optimum cost of this distribution plan.

(Total marks 20)

Q2.

- (a) What structural requirements of a problem are needed to be solved by linear programming? (05 marks)
- (b) Consider the following Linear Programming problem, for which there are 2 constraints and 3 variables representing A, B, and C and unit amounts to be produced denoted by X_1 , X_2 , and X_3 respectively.

Problem in the usual standard form is given as follows:

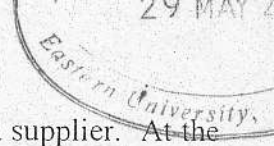
$$\text{Maximize: } Z = 3X_1 + 2X_2 + 4X_3$$

$$\text{Subject to: } 2X_1 + X_2 + X_3 \leq 8$$

$$X_1 + X_2 + 2X_3 \leq 10$$

$$X_1, X_2, X_3 \geq 0$$

- (i) Construct the corresponding dual of this problem. (05 marks)
- (ii) Draw to scale the feasible region of the dual problem using the graphical method (05 marks)
- (iii) Determine the optimal value of the dual variables, which minimize the corresponding dual objective function. (05 marks)



Q3.

(a) XY Pvt Ltd purchases 25, 000 units of a material each year from a supplier. At the moment, the company obtains the material in batch size of 800 units. The material cost Rs. 16 per units; the cost of ordering a new batch from the supplier is Rs.32 and the cost of holding one unit in stock, due to certain storage difficulties, is Rs. 5 per annum plus an interest cost equal to 16% of the purchase price of the material.

Required:

- (i) Calculate the economic order quantity (EOQ) and the annual saving which would be obtained if this order quantity replaced the current order size of units. (06 marks)
- (ii) The supplier has agreed to offer a discount on order beyond a certain size. He has offered the following price structure:

Order size (units)	Unit cost (Rs)
0 – 499	16
500 – 999	15.20
1, 000 & above	14.80

How does this affect the optimal order quantity and what would be the annual savings compared to the inventory costs with EOQ you calculated in (i)?

(10 marks)

(b) State the effect on the economic order quantity in (i) if the unit cost is reduced by 10%.

(04 marks)

(Total 20 marks)

Q4.

(a) Nanda, Managing Director of Project Management Service of ABC Ltd. ABC Ltd has established a project team to undertake some important software development work. It is possible to reduce the expected or "normal" times for certain activities in units of one week (but not in fraction of a week), but at a certain extra cost. The relevant information is given below:

Activity	Preceding Activities	Normal		Crash	
		Duration (weeks)	Cost of Activity (Rs)	Duration (weeks)	Extra cost per week saved (Rs)
A	-	5	4000	3	2,000
B	-	4	3000	4	-
C	A	2	6000	1	1,500
D	C	4	1000	4	-
E	B	5	4000	3	3,000
F	B	5	7000	1	7,000
G	B,C	4	4000	2	20,000
H	F	3	5000	2	10,000

In addition to the cost shown, there is a cost of retainer fees and administration overheads of Rs. 4000 for each week the project lasts.

- What is the normal expected duration of the project, and its total cost?
- What would be the cost of completing the project in the minimum possible time?
- What would be the duration of the project if costs are to be minimized?

(Total 20 Marks)

Q5.

- PQ. Corporation has four plants each of which can manufacture any one of the four products. Product costs differ from one plant to another as follow:

Plant	Product			
	1	2	3	4
A	33	40	43	32
B	45	28	31	23
C	42	29	36	29
D	27	42	44	38

You are required to obtain which product each plant should produce to minimize cost.

(10 marks)



(b) Write short notes on the following

- (i) Shadow price in linear programming** (04 marks)
- (ii) Critical path of a project** (03 marks)
- (iii) Total float of an activity** (03 marks)

(Total 20 marks)