

EASTERN UNIVERSITY, SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT
Third Year First Semester Examination in BBA Honours - 2021/2022
Repeat [February/March 2024]
MGT 3023 Management Science

Answer All Five Questions.

Time: 03 Hours

-
- Q1. (a) Define the term "Management Science".
(02 Marks)
- (b) List out the five main steps of the quantitative decision making process.
(02 Marks)
- (c) Given the following information find the optimum order quantity (Q^*).
Annual Demand (D) = 7200
Ordering cost (C_o) = Rs. 300 per order
Holding cost (C_H) = 0.01Q Rs per unit per year
(05 Marks)
- (d) ABC Limited produces two types of product X and Y. The product X and Y can be sold out at Rs. 500/= and 400/= per unit respectively. Product X and Y have to use two production processes P1 and P2 having the working hours of 12,000 and 20,000 respectively. Product X needs 2 hours per unit in P1 and 5 hours per unit in P2, and Product Y requires 2 hours per unit in P1 and 3 hours per unit in P2.
- (i) You are required to define the decision variables of the above linear programming problem.
(02 Marks)
- (ii) Formulate the objective function of the above linear programming problem.
(01 Mark)
- (iii) Formulate the constraints for the above linear programming problem.
(02 Marks)
- (iv) Formulate the non-negativity restriction of the above linear programming problem.
(01 Mark)

(Total 15 Marks)

- Q2. (a) A distributor has the following units to transport to various receiving points. He wishes to do this at the lowest cost.

Sending Points		Receiving Points			
		150	100	50	200
		A	B	C	D
I	150	8	2	6	4
II	250	4	5	3	2
III	100	3	3	5	6

= 500 Receiving Points

Available = 500

The values in the table are the transportation costs per unit.

- (i) Find the initial allocation and transportation cost by using Least Cost Method.
- (ii) Find the optimal allocation and transportation cost by using Modified Distribution (MODI) method.
- (Total)
- Q3. (a) A company has four machines and has been asked to deal with five jobs. The estimated costs for each job are estimated as follows:

		Machines			
		M1	M2	M3	M4
Jobs	1	6	12	20	12
	2	22	18	15	20
	3	12	16	18	15
	4	16	8	12	20
	5	18	14	10	17

- (i) Allocate the machines to the jobs in order to minimize the total cost.
- (ii) Identify the job which will not be dealt with.

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

Demand = 2000 per annum

Order cost = Rs. 20 per order

Carrying cost = 20% of item price

Basic item price = Rs. 10 per item

The company is offered the following discount on the basic price.

For order quantities

400 -799 less	2%
800 – 1599 less	4%
1600 and over	5%

(i) Find the most economical quantity to order.

(ii) Fill the following table with required working evidences.

Order Quantity	At basic price (EOQ)	400	800	1600
Discount				
Average No. of Order p.a.				
Average No. of Orders saved p.a.				
Ordering cost Saving p.a.				
Price saving per item per annum				
Total Gains				
Stockholding cost p.a.				
Additional costs incurred by increased order				
Net Gain/Loss				

(10 Mark)

(Total 20 Marks)

Q4. Objective Function: Minimize $C = 300x + 500y + 200z$

$$\text{Subject to: } 5x + 3z \leq 2500$$

$$2x = 1000$$

$$3y + 2z \geq 750$$

$$x, y, \text{ and } z \geq 0$$

- (a) Expand (augment) the constraints and objective function for the above programming problem and set up the initial simplex table. (05 M)
- (b) Explain how you would identify the key (pivotal) value in the first simplex table. (05 M)
- (c) Find the number of units have to be produced to minimize the total cost of x, y and z respectively? (10 M)

(Total 20 M)

Q5. Considering the following activities in relation to a project, their normal duration and cost, and the additional cost of reducing activity duration by a day also given to you.

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

No activity permits to save more than one day from its normal duration. The cost per day of the project is Rs. 800/=.

- (a) Draw the network diagram of the above project.
- (b) Find the critical path(s) of this project.
- (c) Find the associated cost of the minimum duration of the project.

(Total 25 M)

Set by: Prof. A Anton Arulrajah

Moderated by: Prof. A Andrew