EASTERN UNIVERSITY SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT

FINAL YEAR SECOND SEMESTER EXAMINATION
BACHELOR OF COMMERCE - 2016/2017 (MARCH 2019) - PROPER / REPEAT

COC 4073 OPERATIONS RESEARCH

Answer All Questions   **Time: 03 Hours**

Q1. (i)   What is the purpose of applying network analysis?

(03 Marks)

(ii)   Explain what is meant by crashing in network analysis?

(03 Marks)

(iii) The information on activities and their multiple time estimates in a project are given below.

Activity	Preceding Activity	Optimistic	Most likely	Pessimistic
A	-	4	7	16
B	A	3	7	11
C	A	5	10	21
D	B	2	10	24
E	C	2	9	28
F	B, E	3	11	19
G	D, F	8	16	18

A. On the basis of the above estimates, calculate the expected time and variance for each activity.

B. Using expected times, determine critical path of the project.

C. Calculate total float for non-critical activity.

D. Calculate the probability of completing project within 65 days.

(14 Marks)

(Total 20 Marks)

Q2. (i) Sunshine needs 1000 coffee packets per year. The cost of each coffee packet is Rs.7[8] Ordering cost is Rs.100 per order. Carrying cost is 40% of per unit cost. Sunshine is ope[n] 365 days per year.

Required to find the followings:

A. The Economic Order Quantity (EOQ).

B. The optimal number of orders per year.

C. The optimal time between orders.

D. Reorder level if lead time is 5 days.

E. Reorder level if lead time is 35 days.

(05 Marks)

(ii) A factory requires 1,500 units of an item per month. The cost of each unit is Rs.27. Th[e] cost per order is Rs.150 and material carrying charge works out to 20% of the averag[e] material. Find out economic order quantity and ascertain the number of orders to b[e] placed per year. Would you accept a 2% price discount on a minimum supply of 1,20[0] units.

(05 Marks)

(Total 10 Marks)

Q3. (i) Differentiate the terms "Balanced transportation problem" and "Unbalance[d] transportation problem".

(04 Mar[ks])

(ii) A company has three factories A, B and C which supply warehouses at D, E and F. Mon[thly] warehouse requirements are 350, 1000 and 900 units respectively. Monthly fac[tory] capacities are 500, 950 and 950 units respectively. Unit transportation costs in rup[ees] are as follows:

Factory	Warehouse		
	D	E	F
A	21	16	25
B	17	18	14
C	32	27	18

The company wants to determine the optimal distribution schedule. You are required the following:

a) Formulate an appropriate linear programming model for the above problem.

b) Find the initial allocation using least cost cell method and the corresponding transportation cost.

c) Find the optimal allocation using stepping stone method and the corresponding optimal transportation cost.

(18 Marks)

(Total 22 Marks)

Q4. (i) What is meant by an assignment problem? Can it be regarded as a special case of transportation problem? Explain.

(04 Marks)

(ii) A company has five jobs to be done. The following matrix shows cost in rupees of assigning each job to each machine.

Machines	Jobs				
	A	B	C	D	E
P	170	150	130	250	150
Q	180	156	132	264	156
R	150	132	114	228	138
S	160	144	120	240	144
T	152	128	112	224	136

Required:

a) Find the assignment of machines to jobs that will result in the minimum cost.

b) Find the total minimum cost from the assignment.

c) Does this problem have more than one optimal solution? If so, find an alternate assignment that result in the minimum cost.

(18 Marks)

(Total 22 Marks)

Q5. **(i)** Anitha electric company produces two products X and Y that are produced and sold on a weekly basis. The weekly production cannot exceed 25 for product X and 35 for product Y, because of limited facilities. The company employs a total of 60 workers. Product X requires 2 man weekly, whereas product Y requires only 1. Profit margin on X is Rs. 60 and on Y is Rs. 40. The company wants to determine the number of units in X and Y to produce weekly in order to maximize profit.

Required:

a) Formulate a linear programming model for this problem.

b) Solve this model by using graphical analysis.

c) How many workers will be unused if the optimal numbers of product X and product Y are produced?

(10 Marks)

(ii) Solve the following linear programming model by simplex method:

Maximize $Z = 2X_1 + 4X_2$

Subject to

$$2X_1 + X_2 \leq 18$$
$$3X_1 + 2X_2 \geq 30$$
$$X_1 + 2X_2 = 26$$
$$X_1, X_2 \geq 0$$

(16 Marks)

(Total 26 Marks)