



University of Kelaniya – Sri Lanka

External Examinations Branch

Bachelor of Commerce (Special) Degree Third Examination (External)- 2010
December 2011/ January 2012

Faculty of Commerce and Management

BCOME 3035 – Operations Research

No. of questions: Six (06)

Time: 03 hours

Answer any five (05) questions.

(01). a) “Operation research consist of quantitative models”. What are the uses of quantitative models for business organization.

(04 marks)

b) Lank Ltd. produces both interior and exterior paints from two raw materials M_1 and M_2 the following table provides the material requirement for the producing paints and profit per unit of each type of paint.

	Exterior paint	Interior paint	Maximum daily availability (tons)
Raw material (M_1) (Tons)	6	4	24
Raw material (M_2) (Tons)	1	2	6
Profit per Tons	5000	4000	

A market survey indicate that the daily demand for interior paint is 2 tons.

Lanka Ltd. wants to determine the optimum product mix of interior and exterior paints that maximize the total daily profit.

i) Develop a linear programming model to represent the above problem.

(06 marks)

ii) Find out the optimal product mix that maximize the profit, using graphical method.

(06 marks)

iii) Identify binding and non binding constraints.

(04 marks)

(Total 20 marks)

(02). a) Name the main disadvantages of graphical solution of linear programming models?

How do you rectify these disadvantages?

(04 marks)

b) The P & D Garment company manufactures men's T-shirts and women's T-shirts for local market. The production process includes cutting, sewing and packaging. P & D Garment employs 25 workers in the cutting department, 35 in the sewing department and 5 in the packaging department. The factory has 8 hour work shift and runs 5 days per week. The following table gives the time requirement and profit per unit for the each type of T-shirts.

Garment	Required minutes per unit			(Rs.)
	Cutting	Sewing	Packaging	Unit Profit
Men's T-shirts	20	70	12	80
Women's T-shirts	60	60	4	120

i) Develop a linear programming model to represent the above problem.

(06 marks)

ii) Find out the optimal product mix in order to maximize profit using graphical method.

(06 marks)

iii) Graphically illustrate the following situations.

I. Infeasible solution

II. Unbounded solutions

(04 marks)

(Total 20 marks)

(03). a) What is the meaning of degeneracy in transportation problem.

(02 marks)

b) Three refineries with daily capacities of 6000, 5000 and 8000 gallon supply gasoline for three distribution areas with daily demand of 40000, 8000 and 7000 gallon respectively gasoline is transported to three distribution area through a network of pipelines. The transportation cost is 10 cent per gallon per km. The mileage chart between the refineries and the distribution area is given below.

Refineries \ Distribution area	1	2	3
	1	120	180
2	300	100	80
3	200	250	120

i). Find the basic solution by using least cost method.

(08 marks)

ii). Calculate the transportation cost.

(02 marks)

c) The model given below is related to a transport problem.

Factories \ Distribution centers	Distribution centers				Supply
	D ₁	D ₂	D ₃	D ₄	
F ₁	7	8	10	3	300
F ₂	6	4	9	2	200
F ₃	5	12	6	10	500
Demand	200	300	450	250	

Find the initial solution and transportation cost by using,

I. North west corner rule

(04 marks)

II. Least cost method

(04 marks)

(Total 20 marks)

4). The table given below is an initial solution for a transportation problem.

Factories \ Distribution centers	Distribution centers				Supply
	D ₁	D ₂	D ₃		
F ₁	100	80	70	120	5000
		3500		1500	
F ₂	120	130	60	100	6000
			4500	1500	
F ₃	80	100	120	140	9000
	7000	2000			
Demand	7000	5500	4500	3000	20000

i). Is this an unbalance transportation problem? Give reason for your answer.

(04 marks)

ii). Find the transportation cost of the initial solution.

(04 marks)

iii). Find the optimal solution and transportation cost by using modified distribution method.

(12 marks)

(Total 20 marks)

(05). a) Following activities are related to a small project.

Activity	Immediate predecessor	Optimistic time (weeks)	Most likely time (weeks)	Pessimistic time (weeks)
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D,E	3	6	5

i) Construct the network diagram for the above problem.

(06 marks)

ii) Determine the critical path.

(04 marks)

iii) Calculate the completion time and expected standard deviation of the project length.

(04 marks)

iv) What is the probability that the project will be completed.

I. Two week earlier than the expected time.

II. Within 20 weeks

(06 marks)

(Total 20 marks)

(06). a) Suppose that you want to invest Rs. 10000 in the stock market by buying shares in two companies A and B. Shares in company A, though risky could yield a 50% return on investment during in the next year (ie "bull" market). If the stock market conditions are not favorable (ie "bear" market) the stock may lose 20% of its value. Company B provide safe investment with 15% return in a "bull" market and only 5% in "bear" market. There are 60% chance for a bull market and 40% for a "bear" market.

i) Draw a decision tree for the above problem.

(06 marks)

ii) Evaluate the decision.

(04 marks)

b) Kelani PLC does not follow Economic Order Quantity (EOQ) model for inventory management. The current inventory policy of the firm is to order 100,000 units when the inventory level falls to 35,000 units. The forecasted demand to meet the production requirement during the year is 625,000 units.

Other information

Ordering cost per order is Rs. 125

Holding cost per units Rs. 0.60

1 year = 50 weeks

Both cost are expected to constant during the year orders are received in two after the ordering.

i) Determine the cost of ordering policy.

(04 marks)

ii) Calculate the savings if the firm adopt EOQ model.

(06 marks)

(Total 20 marks)