NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikiwe Express Way, Jabi, Abuja
Faculty of Science

Course: CIT 756 – Operations Research
Time Allowed:2½ Hours
Instructions: Answer Question 1 and three (3) other questions

Q1 a. Explain the term operations research. (3 marks)
b.Highlights the historical development of operations research. (3 ½ marks)
c.Describe the scientific nature of operations research. (8 marks)
d. Mention three limitations of operations research (3 marks)

Q2 a.Explain the term models in operations research. (4 marks)
b. Discuss four types of operation research models. (12 marks)
c.state the usefulness of linear programming. (1½ marks)

Q3. a. List three properties of linear programming models. (4½marks)
b. Identify two areas linear programming to business. (2 marks)
b.A convalescent hospital wishes to provide at a minimum cost, a diet that has a minimum of 400g of carbohydrates, 200g of protein and 150g of fats per day. These requirements can be met with two foods.

Food	Carbohydrates	Protein	Fats
A	10g	2g	3g
B	5g	5g	4g

If food A cost 33k per ounce and food B cost 15k per ounce, how many ounces of each food should be purchased for each patient per day in order to meet the minimum requirements at the lowest cost?
Required: formulate the LP model. (11 marks)

Q4. The following data is available for a manufacturing company engaged in production of three item X, Y and Z

Production	Time required in hours		Total Contribution (Rs)
	Marching	Finishing	
X	12	3	1000
Y	6	8	800
Z	8	6	400
Company's capacity	3000	1500	

You are required to present the above data in the form of LLP to maximise the profit from the production and solve the problem using simplex method.

(17½ marks)

Q5. a. Explain the concept of goal programming. (4 marks)

b. ABC Ltd produces two types of product P-1 and P–2 using common production facilities which are considered scare resources by the company. The scarce production facilities are in the two departments of Machining and Assembling. The company is in a position to sell whatever number it produces as their brand enjoys the market confidence. However, the production capacity is limited because of the availability of the scarce resources

The company wants to set a goal maximum daily profit, because of its other problems and constraints and would be satisfied with #2000 daily profit. The details of processing time, capacities of each of the departments and unit profit combinations of products P1 and P2 are given in the table below:

Type of product	Time to process each product (Hours)		Profit contribution per unit
P_1	3	1	200
P_2	2	1	300
Time available (hours) per day	100	50	

The company wishes to know the product mix that would get them the desired profit of ₦2000 per day. Formulate the problem as goal programming model. (1marks

Q6. a. List with examples the classification of inventory. (4½ marks)

b. Mention two reasons for holding stock. (2 marks)

c.The managing director of a manufacturing company suspects that, he is not importing a particular spare part in the most economical way. A financial analysis shows that:
It cost ₦850 to make an order.
Each item cost ₦83.60.
The annual holding costs are 15per cent of the price paid.
The current annual consumption is ₦650,000.00

You are required to determine:

(i) The best order size.
(ii) The number of days this supply would last.
(iii) The number of orders per year? (Assume 1year = 260 working days).

(11 marks)