NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16, Ahmadu Bello Way, Victoria Island, Lagos

SCHOOL OF SCIENCE & TECHNOLOGY
October, 2013 Examination

Course Code: CIT 756

Course Title: OPERATIONSRESEARCH

Instruction: Answer Any Five Questions

Time Allowed: 3 Hours

1a. List four of the basic facts of Operations Research as a concept
4 marks
b. Why is Operations Research an adaptation of scientific approach?.
3 marksc. State the seven stages of Operations Research
7 marks

2a. What do you understand by modeling and models? 5 marks

b. The sales manager of Turnover Limited maintains he could increase the sales turnover (in units) of any of the company's product by 50 percent if he was authorized to give a 10% price discount and place appropriate additional advertising matter. The Board wishes to know the maximum additional advertising expense they can incur in respect of any given product without the manager's proposal resulting in a smaller profit.
9 marks

3 A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators much be shipped each day.
If each scientific calculator sold results in a N2 loss, but each graphing calculator produces a N5 profit, how many of each type should be made daily to maximize net profits? 14 marks

4. A manufacturing company has divided its total target market into three zones. The Company's marketing department has been collecting data regarding the deployment of salesmen and the sales made in each zones. They have realized that
the sales are directly dependent upon the number of salesmen in each zone. The data collected by the company is given in the table below. For various reasons, the
company has decided to retain only 9 salesmen during the next year.
Determine the allocation of these salesmen to these three different zones, so that the total
sales cab net is maximized.
14 Marks

No. of Salesmen	Profits in Thousands of Naira		
	Zone 1	**Zone 2**	**Zone 3**
0	35	40	45
1	40	50	50
2	45	65	60
3	60	75	70
4	70	85	80
5	80	95	90
6	90	100	100
7	105	105	110
8	100	100	120
9	90	105	100

5 The sales manager of Turnover Limited maintains he could increase the sales turnover (in units) of any of the company's product by 50 percent if he was authorized to give a 10% price discount and place appropriate additional advertising matterThe Board wishes to know the maximum additional advertising expense they can incur in respect of any given product without the manager's proposal resulting in a smaller profit

14 marks

6. Big Bros. Inc. is an investment company doing an analysis of the pension fund for a certain company. A maximum of $¿10$ million is available to invest in two places. No more than $¿8$ million can be invested in stocks yielding 12% and at least $¿2$ million can be invested in long-term bonds yielding 8% . The stock-to-bond investment ratio cannot be more than 1 to 3 . How should Big Bros. advise their client so that the pension fund will receive the maximum yearly return on investment? You are required to formulate the required LP model 14marks

7. A farmer has 100 acres on which to plant two crops: corn or wheat. To produce these crops, there are certain expenses as shown in the table.

Item	Cost per Acre $(¿)¿$
Corn Seed Fertilizer Planting/care/ harvesting	 12 58 50
Total	120
Wheat Seed Fertilizer Planting/care/ harvesting	 40 80 90

Total	210

After the harvest, the farmer must store the crops awaiting proper market conditions. Each acre yields an average of 110 bushels of corn or 30 bushels of wheat. The limitations of resources are as follows:

Available capital: $¿15,000$.

Available storage facilities: $4,000$ bushels.

If net profit (the profit after all expenses have been subtracted) per bushel of corn is $¿1.30$ and for wheat is $¿2.00$, how should the farmer plant the 100 acres to maximize the profits? 14 marks