NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE & TECHNOLOGY
JANUARY/FEBRUARY 2013 EXAMINATION

CIT 756 – OPERATIONS RESEARCH

Instruction: Answer Any Five Questions
Time Allowed: 3 Hours

1a. List four basic facts of Operations Research as a concept
4 marks

b. Why is Operations Research an adaptation of scientific approach?
3marks

c. State the seven stages of Operations Research
7 marks

2a. Explain the following terms: (i) modeling (ii) models 4 *marks*

b. Outline the five (5) assumptions of Linear Programming
10 *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 convalescent hospital wishes to provide at a minimum cost, a diet that has a minimum of $200g$ of carbohydrates, $100g$ of protein and $120g$ 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 $29k$ 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?

You are required to formulate the LP model. *14 marks*

5 A special diet for a patient in the hospital must have at least 8000 units of vitamins, 100 units of minerals and 2800 units of calories.Two types of foods X and Y are available in the market at the cost of #8
and #6 respectively. One unit of X contains 40 units of vitamins, 2 units of minerals and 80 units of calories. One unit of food B contains 200 units of vitamins, 4 units of minerals and 80 units of calories. What combination of foods X and Y can be used so that the minimum requirement of vitamins, minerals and calories is maintained and the cost incurred by the hospital is minimised? 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 *14 marks.*

7. A metal alloy used in the manufacture of rifles uses two ingredients A and B. A total of 120 units of alloy are used for production. Not more than 60 units of A can be used and at least 40 units of ingredient B must be used in the alloy. Ingredient A costs Rs. 4 per unit and ingredient B costs Rs. 6 per unit. The company manufacturing rifles is keen to minimise its costs. Determine how much of A and B should be used.
14 marks