NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

CIT 656 – OPERATIONS RESEARCH

INSTRUCTIONS: Answer Any Five Questions

1a. Define Operations Research
b. List the stages in Operations Research
c. State the role of Operations Research in business
2a. Differentiate between the following mathematical models:
Quantitative and Qualitative
Probabilistic and Deterministic
Linear and Non Linear
b. State an approach for transforming a word problem into a mathematical program

3 ONIJOGBO manufactures two types of settee; half-upholstered and full-upholstered. The contribution per unit to profit is ¿80 for half-upholstered and ¿90 for full-upholstered. The amount of materials needed per product and maximum available materials are given below:

Product	Unit of Material		
	Wood	Foam	Cover
Half-upholstered	2	2	5
Full-upholstered	1	4	5
Maximum available	12	24	35

You are required: formulate the linear programming model for the above problem.

4. Solve the linear program

Max $x_1 + x_2$

$2X_1 + X_2 \leq 4$

$X_1 + 2X_2 \leq 3$

$X_1 \geq 0, X_{\geq} \geq 0$

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 matter. The Board wish 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.

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?
Formulate the required LP model.

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	12
Fertilizer	58
Planting/care/	50

harvesting	
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?