NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
MARCH/APRIL 2016 EXAMINATION

SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE: **CIT425**
COURSE TITLE: **OPERATIONS RESEARCH**

Time: **3 HOURS**
INSTRUCTION: ***Answer any FOUR questions.***

1.
   a. Briefly explain the application of Operations Research in business. *(7.5 marks)*
   b. List five challenges facing Operations Research. *(7.5 marks)*
   c. Briefly explain what a model is. *(5 marks)*

2.
   a. Mention five prototypes, listing their nature and solution techniques.
   b. *(8 marks)*
   c. Differentiate between static and dynamic models. *(6 marks)*
   d. Briefly describe the three steps used in the formulation of a linear Programming model. *(4 marks)*

3.
   a. A linear programming problem is paused as follows: Find the values of $y_1$and y_2 that will maximize $C=15\,y_1+25\,y_2$ subject to the following constraints:

$$2y_1 + 5y_2 \leq 25$$
$$6y_1 + 5y_2 \leq 45$$
$$y_1, y_2 > 0$$

   Determine and sketch the corner points and hence solve the problem. *(15 marks)*
   b. Briefly outline 5 classes of mathematical models. (*5 marks*)

4.
   a. List five major assumptions made in Linear Programming. (*10 marks*)
   b. Describe Vogel's Approximation Method and write down its algorithm. (*6 marks*)
   c. Briefly explain the concept of Optimality. *(4 marks*)

5.

a. Write a brief note on three approaches in the analysis and interpretation of a business problem. (*6 marks*)

b. A cement manufacturer has three plants (one each in Ashaka, Gusau and Ibadan) and distributes the product to four warehouses (one each in Enugu, Lokoja, Kano and Lagos). The capacity of the plants and the demands of the warehouse are stable and have values as shown in the following table. The unit shipping costs are also indicated in the intersection squares of the table. Determine an optimal distribution plan for the company.

PLANTS	WAREHOUSES				**MONTHLY CAPACITY**
	ENUGU	LOKOJA	KANO	LAGOS	
ASHAKA	8	5	4	10	**40**
GUSAU	10	6	3	10	**30**
IBADAN	6	4	7	3	**70**
MONTHLY DEMANDS	**25**	**20**	**35**	**40**	140 120

(14 marks)

6.

a. Write down three basic characteristics of a queuing system. (*6 marks*)

b. A convalescent hospital wishes to provide at a minimum cost, a diet that has a minimum of 200g of carbohydrates, 100g of protein and 120 g of fats per day. These requirements can be met with two food items with the following constituents:

Food	Carbohydrates	Proteins	Fats
A	7g	3g	2g
B	6g	5g	4g

If food A costs 29k per ounce and food B costs 15k per ounce, how many ounces of each food should be purchased for each patient per day so as to meet the minimum requirements at the lowest cost?

(*14 marks*)