



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCE
JULY 2017 EXAMINATIONS

COURSE CODE: CIT756

COURSE TITLE: OPERATIONS RESEARCH

CREDIT UNITS: 3

TIME ALLOTTED: 2 HOURS, 30 MINUTES

INSTRUCTION: ***Answer Question 1 and any other FOUR questions. Cordless nonprogrammable calculators may be used.***

1.

- a. Briefly describe what Operations Research is.
(5 marks)
- b. What are the salient limitations of Operations Research? (5 marks)
- c. Briefly explain the role of digital computers in operations research.
(2 marks)
- d. List five major assumptions made when using Linear-programming techniques.
(5 marks)
- a. Write down three basic characteristics of a queuing system.
(5 marks)

2.

Consider the linear programming problem given below:

$$\begin{array}{ll} \text{Maximize } P = & 40x + 30y \\ \text{Subject to:} & x + 2y \leq 16 \\ & x + y \leq 9 \\ & 3x + 2y \leq 24 \\ & x, y \geq 0 \end{array}$$

- a) What technical name is given to the function P? (2 marks)
- b) Mention the name given to the first three inequalities. (2 marks)
- c) The last condition above is called what? (2 marks)
- d) Sketch the feasibility region and hence determine the optimum solution. (6 marks)

3.

- a) Briefly explain Vogel's Approximation Method and describe its algorithm. (6 marks)
- b) Briefly describe the concept of Optimality. (6 marks)

4. a) Using tabular form, outline the major prototypes and common techniques available for solving operation research problems. (6 marks)
- b) Write short notes on the following types of models:
- probabilistic
 - deterministic
 - simulation
 - iconic
- (6 marks)

5.

- a. Briefly describe three approaches used in the analysis of a business problem. (5 marks)
- b. A cement manufacturer has three plants (one each in Sokoto, Osogbo and Uyo) and distributes the product to four warehouses (one each in Benin, Lagos, Kaduna, Enugu and Jos). 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
	Benin	Lagos	Kaduna	Enugu	Jos	
Sokoto	12	25	8	13	9	80
Osogbo	8	9	9	9	10	60
Uyo	7	10	11	8	11	60
MONTHLY DEMANDS	20	55	50	35	30	200 190

(7marks)

6.

- a. Briefly describe the salient features of a dynamic model. (5 marks)
- b. The marketing department has collected data regarding the deployment of salespersons and sales made in three zones of its target market. There is evidence that sales are directly dependent on the number of salespersons in each zone as indicated by the collected data shown in the table below. If the company has decided to retain 9 salespersons during next year determine the allocation plan for these salespersons to the three zones so as to maximize sales.

NO. OF SALESPERSONS	PROFITS IN THOUSANDS OF NAIRA		
	ZONE 1	ZONE2	ZONE3
0	20	25	30
1	25	35	35
2	30	50	45
3	45	60	55

4	55	70	65
5	65	80	75
6	75	95	85
7	90	95	100
8	85	85	110
9	75	90	85

(7 marks)