NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi-Abuja

FACULTY OF SCIENCES
November, 2018 Examinations

Course Code: MTH309
Course Title: Optimisation Theory
Credit Unit: 3
Time Allowed: 3 Hours
Total: 70 Marks
Instruction: Answer Question One and Any Other 4 Questions

1. (a) Briefly describe what you understand by the following:
    i)   Linear programming
    ii) Operation Research
    iii) Sensitivity analysis
    iv) Transportation problem   **(1.5 marks for each = 6marks)**

(b) A manufacturer produces two models of bicycles. The time (in hours) required for assembling, painting, and packaging each model is as follows.

	Model A	Model B
Assembling	2	1
Painting	1	2
Packaging	1	1

The total time available for assembling, painting, and packaging is 6 hours, 6 hours, and 5 hours respectively, and that the cost per unit is ₦500 (Model A), ₦800 (Model B). Use graphical method to obtain the number of each type to be produced at a minimum cost?   **16marks**

2. Use the algebraic method to solve the LLP
    Minimize $z = 6x_1 + 5x_2$
    Subject to: $x_1 + x_2 \leq 5$
                 $3x_1 + 2x_2 \leq 12$
                 $x_1, x_2 \geq 0$ **12marks**

3. (a) Define i) Feasible solution ii) Basic feasible solution of a transportation Problem   **2Marks**

b) Find the initial basic feasible solution for the following transportation problem by VAM.

SOURCE	DESTINATION				
	D_1	D_2	D_3	D_4	Supply
S_1	11	13	17	14	250
S_2	16	18	14	10	300
S_3	21	24	13	10	400
DEMAND	200	225	275	250	

10Marks

4. (a) Define the following terms:
    i)   Integer Programming Problem
    ii)   Pure Integer Programming Problem

    iii)   Mixed Integer Programming Problem   **6marks**

    b) List and briefly explain two methods that can be used to solve Integer Programming Problem

6marks

5. Illustrate sensitivity analysis using simplex method to solve the following LPP:

$$\text{Maximize} \quad z = 20x_1 + 10x_2$$
$$\text{Subject to:} \quad x_1 + x_2 \leq 3$$
$$3x_1 + x_2 \leq 7$$
$$x_1, x_2 \geq 0$$ **12marks**

6. (a) Define the following
    (i)   Optimization problem in $\mathbb{R}^2$ **2 marks**
    (ii)   Objective functions   **1½ marks**
    (iii)   Optimal Value   **1½ marks**

    (b) Name and define two types of optimization problem.   **5 marks**

    (c) State two objectives of optimization problem   **2Marks**