BOWEN UNIVERSITY, IWO
(OF THE NIGERIAN BAPTIST CONVENTION)
COLLEGE OF MANAGEMENT AND SOCIAL SCIENCES (COMSS)
BUSINESS ADMINISTRATION PROGRAMME
B.Sc. BUSINESS ADMINISTRATION DEGREE
2022/2023 SECOND SEMESTER EXAMINATION

COURSE CODE: BUS 204
COURSE TITLE: Quantitative Methods
CREDIT: 3
TIME: 3 HOURS
INSTRUCTIONS: ANSWER QUESTION 4 AND ANY OTHER 3 QUESTIONS
DATE: JUNE 17, 2023

1. (a) Linear programming is one of the mathematical programming techniques that is useful to management scientists in optimisation. Explain the requirements of linear programming

   (6 Marks)

   (b) What is the standard form of a linear programming problem and when is it required?

   (3 Marks)

   (c) Explain what a slack variable means and indicate its usefulness in linear programming

   (3 Marks)

   (d) Briefly explain the various types of objectives that a linear programmer may seek to achieve **(3 Marks)**

2. (a) The distance from Ede-Obala to Abagana may be 70 KM while the distance from Ede-Obala to Umudioka may be 130KM. Yet, the cost of transporting a unit of product from Ede-Obala to Umudioka might be cheaper than the cost of transporting a unit of product from Ede-Obala to Abagana. With your understanding of the transportation problem in quantitative techniques, explain why this might be the case? Give a comprehensive explanation **(6 Marks)**

   (b) Write short notes on the initial solution techniques and optimum solution techniques in a transportation problem **(4 Marks)**

   (c) Briefly explain what you know about entering and leaving variables in a linear programming problem **(5 Marks)**

3. (a) Write short notes on the following concepts

    (i)   Pivot column   (3 Marks)

    (ii)   Pivot row   (3 Marks)

    (iii)   Pivot element   (3 Marks)

    (iv)   Corner Solution   (3 Marks)

    (v)   Basic Variable   (3 Marks)

4. (a) The initial tableau of a linear programming problem is given below

Initial Tableau

BASIC	Z	X_1	X_2	X_3	S_1	S_2	S_3	RHS	RATIO
S_1		7.5	5	2.5	1	0	0	545	109
S_2		2.5	5	5	0	1	0	335	67
S_3		5	2.5	7.5	0	0	1	375	75
Z		-50	- 60	- 50	0	0	0	0	

    (i)   Determine the entering variable   (2 Marks)

    (ii)   Determine the leaving variable   (4 Marks)

    (iii)   Formulate the linear programming problem   (5 Marks)

(b)   The final tableau of the problem is given below:

Final Tableau

BASIC	Z	X_1	X_2	X_3	S_1	S_2	S_3	RHS
X_1		1	0	-1/2	1/5	--1/5	0	42
X_2		0	1	5/4	-1/10	3/10	0	46
S_3		0	0	55/8	-3/4	¼	1	50
Z\		0	0	0	4	8	0	4860

(i)   Provide the primal solution to the problem   (3 Marks)

(ii)   Provide the dual solution   (3 Marks)

(iii)   Explain the underlying assumptions here   (4 Marks)

(iv). Explain the none negativity constraint in a linear programming problem   (4 Marks)

5 (a) A given item is available at Warri, Akure, Adoekiti and Ilorin. It is required at Lagos, Port-Harcourt and Okene. The table below shows the intercity transport costs.

	Lagos	Port-Harcourt	Okene
Warri	20	70	40
Akure	30	30	10
Adoekiti	50	40	70
Ilorin	10	60	20

The units of items available are 5000, 8000, 7000 and 14000 at Warri, Akure, Adoekiti and Ilorin respectively. The required quantities are 7000, 9000 and 18000 at Lagos, Port-Harcourt and Okene respectively.

   (a) Determine the shipments using North-west corner solution   (3 Marks)
   (b) Determine the shipments using least cost method   (3 Marks)
   (c) Determine the shipments using Vogel approximation   (3 Marks)
   (d) Determine the shipments using an optimal solution method   (6 Marks)

6. (a) Game theory is one mathematical modelling technique that has assumed monumental importance in the Management Sciences in recent times owing to its increasing relevance to organisational processes, discuss. Briefly explain the real-life application of Game theory to Business   (5 Marks)

(b) Determine the optimum strategies and the value of the game for the following 3 x 5 payoff matrix game

$$P = \begin{bmatrix} 600 & 800 & 400 & 500 & 700 \\ 500 & 600 & 700 & 800 & 700 \\ 300 & 200 & 500 & 400 & 500 \end{bmatrix}$$ (10 Marks)