BOWEN UNIVERSITY, IWO
College of Management and Social Sciences
Business Administration Programme
Second Semester 2021/2022 Examination

Level	: 200
Course Title	: Quantitative Analysis
Course Code	: BUS 204
Credit	: 3
Instruction	: Answer Question 4 and any other 3 Questions
Time Allowed	: 2 Hours, 30 Minutes
Date	: Friday 22nd of July, 2022

1. (a) Gaming is inevitable in contemporary organisations, whether public or private, discuss

(5 Marks)

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

matrix game

$$P \quad = \quad \begin{bmatrix} 600 & 400 \\ 500 & 700 \end{bmatrix}$$ **(10 Marks)**

2. (a) Mathematical modelling is critical to the optimization of real-life problems, provided that the problems are adequately expressed in mathematical form. What is a mathematical model? Present a general form of the mathematical model and explain the inputs of the model **(2 Marks)**

(b) Assumptions are crucial to the workings of a model and every model has underlying assumptions. What are assumptions? Why are they sacrosanct to the workings of a model?

(3 Marks)

(C) Distinguish between deterministic and stochastic models and give one example of an each of the two **(2 Marks)**

(d) Controllable and uncontrollable variables are inherent in mathematical models. Briefly explain what these variables mean **(2 Marks)**

(e) Given that Total Revenue = TR and Total Cost = TC, show that $\quad q = \dfrac{FC}{(s - v)}$

Where q $\quad$ = the units of output consistent with breakeven. **(6 Marks)**

3. (a) What is transportation problem as used in mathematical modelling? Explain the relevance of the transportation problem the cost minimisation strategy of a firm **(3 Marks)**

(b) Present a mathematical specification of the transportation problem **(6 Marks)**

(c) Robustly explain the factors that affect the cost of transporting a unit of material from [one] location to another with specific focus on why a route with a shorter distance might me more co[stly] than a route that is relatively farther (**3 Marks**)

(d) Present a comprehensive explanation of the solution techniques to a transportation prob[lem] and indicate the most appealing to you and why (**3 Marks**)

4. A production manager who produces item W has three warehouses at (OKK), Debreke[re] (DBM) and Ugoniyekoriomwon (UGY) (ET) communities. Item W is required at f[our] destinations; Koton Karifi (KK), Ejigbo (EJ), Gbaramatu Kingdom (GRK) and Gwagwara[m] (GGR). The quantity of W available at OKK, DBM an UGY are 4000, 6000 and 2000 respective[ly]. 3000, 2000, 2000 and 5000 units of W are required at KK, EJ, GRK and GGR respectively. T[he] cost of transporting one unit of W from OKK to KK, EJ, GRK and GGR are N50, N50, N30 a[nd] N20 respectively. In the same vein, it cost N20, N70, N40 and N60 to transport one unit of W fr[om] DBM, to KK, EJ, GRK and GGR respectively while one unit of W will cost N60 N40 N30 a[nd] N40 from Etekibiabor (ET) to KK, EJ, GRK and GGR respectively.

Required:

(i) Present a diagram to show the transportation problem (**3 Marks**)

(ii) Solve the problem using all two initial solution techniques known to you (**6 Marks**)

(iii)   Provide an optimal solution to the problem (**6 Marks**)

5. (a) State and explain the assumptions of Linear programming   (**3 Marks**)

(b) what are the requirements of Linear programing (**3 Marks**)

(c) A farmer raises Rabbits and Grass cutters. He wants to raise not more than 40 animals includi[ng] at most 25 Rabbits. He requires Types A and B meals to raise the animals. To raise a Rab[bit] requires 15Kg of Type A meal and 5 Kg of type B meal, A Grass Cutter requires 25 Kg and [15] Kg of types A and B meals respectively. At least 240 Kg of Type A and 160 Kg of type B me[al] are required. It cost him N840 to raise a rabbit and N2050 to raise a Grass Cutter. (i) **Formula[te] the problem as a linear programming problem but do not solve (4 Marks)**

(ii) Formulate the dual problem (**2 Marks**)

(d) Distinguish between slack variables, surplus variables and artificial variables as used in line[ar] programming (**3 Marks**)

6. The management of Omotoyosi Plc. is trying to decide on the production quantity of thre[e] products Yalagbish (Y), Beretrovoniyi (B) and Sakadome (S). The inputs required to produc[e]

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the products are Coal, Diesel and Aluminium. One measure of Y requires 30 metric tonnes of Coal, 10 litres of diesel and 20 square metres of Aluminium; One measure of B requires 10 metric tonnes of Coal, 20 litres of diesel and 30 square metres of Aluminium. In addition, one measure of S requires 20 metric tonnes of Coal, 20 litres of diesel and 10 square metres of Aluminium. There are 2180 metric tonnes of Coal, 1340 litres of diesel and 1500 square metres of aluminium available. A unit of Y sells for N600; similarly, B sells for N520 and S sells for N660.

(i) Determine the quantities of each that should be produced if Omotoyosi's management is bent on maximizing Revenue.   (11 Marks)

(ii) Formulate and provide the dual solutions (4 Marks)