NATIONAL OPEN UNIVERSITY OF NIGERIA,

PLOT 91, CADASTRAL ZONE, UNIVERSITY VILLAGE, JABI – ABUJA

FACULTY OF SCIENCES

2021_245678

COURSE CODE: CIT 425
COURSE TITLE: OPERATIONS RESEARCH
CREDIT: 3 UNITS
TIME ALLOWED: 2 HOURS 30 MINUTES
INSTRUCTION: ANSWER QUESTION ONE (1) AND ANY OTHER FOUR (4)

QUESTION ONE (22 MARKS) COMPULSORY

1a. Briefly explain the Concept of Operations Research as an adaptation of the scientific approach **(7 marks)**
1b. Enumerate any four (4) standard Operations Research models **(4 marks)**
1c. What is the difference between Quadratic and Integer Programming? (**5 marks)**
1d. State in a tabular form any four (4) common prototypes and their common solution techniques. **(6 marks)**

2. A company makes three models of desks; an executive model, an office model and a student model. Each desk spends time in the cabinet shop, the finishing shop and the crating shop as shown in the table:

Type of desk	Cabinet shop	Finishing shop	Crating shop	Profit
Executive	2	1	1	150
Office	1	2	1	125
Student	1	1	0.5	50
Available hours	16	16	10	

Formulate this as an Optimization Problem and determine how many of each type of model should be made to maximize profits? **(12 marks)**

3a. Explain any four (4) assumptions of Linear Programming **(4 marks)**

3b. Enumerate the three (3) steps that are used to formulate the model of any optimization problem. **(3 marks)**
3c. In succinct terms, enumerate the Vogel's approximation algorithms **(5 marks)**

4. A large factory makes tables and chairs. Each table returns a profit of $200 and each chair a profit of $100. Each table takes 1 unit of metal and 3 units of wood and each chair takes 2 units of metal and 1 unit of wood. The factory has 6K units of metal and 9K units of wood. Using graphical method, find how many tables and chairs the factory should make to maximize profit? **(12 marks)**

5. The Linear programming Problem below is already in standard form where s1 and s2 are slack variables. Use Simplex Method to find the optimal value of the cost function.

minimize $4xA1 + 6xA2 + 4xA3 + 6xB1 + 5xB2 + 2xB3$
subject to $xA1 + xA2 + xA3 + s1 = 60$
$xB1 + xB2 + xB3 + s2 = 60$
$xA1 + xB1 = 40$
$xA2 + xB2 = 40$
$xA3 + xB3 = 40$
$xA1, xA2, xA3, xB1, xB2, xB3, s1, s2 \geq 0$ **(12 marks)**

6a. Enumerate the six (6) steps used in solving Linear Programming problems using simplex method **(6 marks)**
6b. Explain the following important terms used in dynamic programming **(3 marks)**
(i) Stage (ii) State (iii) Forward and Backward Recursive approach
6c. what is a Balanced Transportation Problem? **(3 marks)**