



CRAWFORD UNIVERSITY

FAITH CITY, IGBESA, OGUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES

B.Sc. EXAMINATION HARMATTAN SEMESSTER 2018/2019 SESSION

CSC313: OPERATIONS RESEARCH

TIME ALLOWED: 3 HOURS

INSTRUCTIONS: ANSWER 4 QUESTIONS ONLY

1... A poultry farmer has a poultry house with a maximum capacity of 1000 birds where he plans to raise turkey, cockerels and egg laying hens. The table below shows cost of raising each bird to maturity as well as the profit per unit. The total cash available for raising the birds is 2,250,000 naira. The objective is to maximise the profit.

Bird	Unit Raising Cost	Unit profit
Turkey	7,500	3,000
Cockerel	1,500	700
Hen	1000	400

- Define the LP problem making sure to first define your variables (4 marks)
- Use the simplex method to obtain the optimum point (7 marks)
- From your simplex tableau state the profit and the number of each bird at optimum. (4 marks)

2 (a) What is a slack variable ?(1 mk)

b) (i) Use the simplex method to obtain the optimum point for the following LP problem: (10 mks)

$$\text{Maximise } 5x_1 + 9x_2 + 7x_3$$

$$\text{Subject to: } x_1 + 3x_2 + x_3 \leq 36;$$

$$x_1 + 6x_2 + 4x_3 \leq 120;$$

$$x_i \geq 0, i=1,2,3$$

(ii) From your simplex tableau state the optimum values for x_1, x_2, x_3, Z (4 mks)

3. Crawford Ventures needs a minimum of 10,000 litres of kerosene for Camp meeting sales. There are two sources of supply. Source A is in Agbara with a maximum capacity of 7,000 litres. Source B is in Mosimi with a maximum capacity of 10,000 litres but Source B insists on a minimum purchase of 6,000 litres. The cost/litre is ₦160 for source A and ₦180 for source B. The objective is to minimise the total cost of kerosene.

- Define the L. P. problem. (5 mks)
- Solve the L.P. problem using the graphical method.(7 mks)
- State clearly the optimal volume of kerosene from each source and the minimum total cost. (3 mks)

4 A linear programming problem is stated as;

$$\begin{aligned} \text{Minimise} \quad & Z = 5x_1 + 7x_2 \\ \text{Subject to;} \quad & 2x_1 + 3x_2 \geq 42 \\ & 3x_1 + 4x_2 \geq 60 \\ & x_1 + x_2 \geq 18 \end{aligned}$$

- Determine the dual of the problem. (4 marks)
- Solve the dual of the problem by simplex method. (8marks)
- State values of Z , x_1 , x_2 at the optimum value. (3marks)

5. Seven-UP Bottling Company produces carbonated drinks for Lagos market from two plants located at Ijora and Oregun whose daily production capacities are 500,000 and 800,000 crates respectively. They operate six depots located at Ikeja, Oshodi, Obalende, Ajah, Badagry and Egbeda whose daily demands (in thousand crates) are 400, 300, 200, 150, 130 and 120 respectively. The table below shows the cost of delivery in naira per crate from each factory to each depot.

Factory	Ikeja	Oshodi	Obalende	Ajah	Badagry	Egbeda
Ijora	8.5	8	7	10	18	15
Oregun	5	7	12	15	19	20

- Determine if this is a balanced transport problem. (1 mk)
- Determine the initial basic feasible solution by North West method. What is the transportation cost? (4mks)
- Determine the initial basic feasible solution by the least cost method. What is the transportation cost?(5mks)
- Determine the initial basic feasible solution by Vogel's approximation method. Calculate the transportation cost. (5mks)

6 The coordinator of JUPEB program in a university has 4 lecturers to whom he must allocate a course each to prepare foundation students for the external JUPEB exams .The table below shows the likely average score by the students for each course when handled by different lecturers.

Lecturers	Maths	Chemistry	Physics	English
Dr Olu	70	44	42	40
Dr Ake	46	50	38	36
Dr Abia	44	38	34	42
Dr Shittu	40	36	36	28

- Determine the optimum assignment of the courses to the lecturers for maximise students score. (13 marks)
- Calculate the total JUPEB score for the average student. (2mks)

Good Luck