

**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**DIPLOMA IN LOGISTICS**

**MAY-AUGUST 2014 SEMESTER**

**MAIN EXAMINATION**

**FUNDAMENTALS OF OPERATIONS RESEARCH**

**DURATION; 2 HOURS**

**INTRUCTIONS; ANSWER QUESTION ONE AND ANY OTHER TWO**

**SECTION A**

1. a) What is meant by operations research? ( 2 marks)
- b) What are the essential features of linear programming problems? ( 6 marks)
- c) Explain the meaning of the terms:
  - i) Objective function ( 2 marks)
  - ii) Constraints ( 2 marks)
- d) Solve the following quadratic equations.
  - i)  $6x^2+8x+2=0$  (3 marks)
  - ii)  $6x^2-x-2=0$  (3 marks)
- e) Differentiate between a finite and an infinite set (4 marks)
- f) If  $U=(1,2,3,4,5,6,7)$ ,  $A= ( 1,4,6,7)$ , find  $A'$  (2 marks)
- g) Differentiate the following functions.
  - i)  $y=x^3$  (2 marks)
  - ii)  $y=x^{5/3}$  (2 marks)
  - iii)  $y= x$  (2 marks)

**SECTION B** { } { }

2. A research was conducted on Greta University students to test their interest in three subjects; Mathematics; Business statistics; and Communication skills. It was noticed that 35 students are interested in Mathematics, 20 are interested in Business statistics and 20 are interested in Communication skills. Out of them, 7 are interested in both mathematics and Business statistics, 4 are interested in both business statistics and communication skills, 6 are interested in both mathematics and communication skills and 2 are interested in all the three subjects. Find out the total number of students. (20 marks).

3. A firm produces two products X and Y with a contribution of Kes 8 and Kes 10 per unit respectively. Product data is as follows ( per unit);

	Labour hours	Material A	Material B
X	3	4	6
Y	5	2	8
Total available	500	350	800

- Formulate the LP model
- Solve the problem graphically
- Calculate the shadow prices of the binding constraints and interpret. ( 20 marks)

4. The cost of producing x units in a firm is given as; total cost (TC) =  $x^2+6x+18$ . The price per unit is Kes 20.

- Find the profit function (15 marks)
- How much profit will the firm make if it produces 50 units? (5marks)

5. A factory produces four products A,B,C and D which earn contributions of Kes 20, Kes 25, Kes 12 and Kes 30 per unit respectively. The factory employs 500 workers who work a 40 hour week. The times required for each product and the material requirements are set out below.

Products

	A	B	C	D
Hours per unit	6	4	2	5
Kg material X/unit	2	8.3	5	9
Kg material y/unit	10	4	8	2
Kg material z/unit	1.5	0	2	8

Total available materials per week is X= 100,000kgs, Y= 65,000kgs, Z= 220,000kgs

The company wishes to maximize contribution.

- a) Formulate the PL problem in the standard manner. ( 8 marks)
- b) State the two advantages and two disadvantages of simulation. (4 marks)
- c) Explain four features of a good model in operations research ( 8 marks)