National Open University of Nigeria
Plot 91, Cadastral Zone, NnamdiAzikiwe Expressway, Jabi - Abuja
Faculty of Science
Department of Computer Science
2023_1 POP EXAMINATION

COURSE CODE: CIT 425
COURSE TITLE: Operation Research
CREDIT: 3 Units
TIME ALLOWED: 3 Hours
INSTRUCTION: Answer Question ONE (1) and any other THREE (3) Questions

QUESTION ONE

a. Enumerate the types of model used in operation research (4 Marks)
b. A farmer has 200 acres of land. He produces three products X, Y & Z. Average yield per acre for X, Y & Z is 4000, 6000 and 2000 kg.
   Selling price of X, Y & Z is Rs. 2, 1.5 & 4 per kg respectively. Each product needs fertilizers. Cost of fertilizer is Rs. 1 per kg. Per acre need for fertilizer for X, Y & Z is 200, 200 & 100 kg respectively. Labour requirements for X, Y & Z is 10, 12 & 10 man hours per acre. Cost of labour is Rs. 40 per man hour. Maximum availability of labour is 20, 000 man hours.
   Formulate as Linear Programming Problems to maximise profit.(6 Marks)
c. Explain the concept of a model.(3marks)
d. i. Itemize the basic facts of Operations Research concept (5marks)
   ii. Give specific examples of its application in business. (5marks)
e. Briefly describe any two steps involved in the formulation of a linear Programming model.(2 marks)

QUESTION TWO

a. Identify five(5) areas of application of linear programming. (5marks)
b. Enumerates six (6) advantages of linear programming. (5 marks)
c. Explain the steps that are involved in the formulation and solution of Dynamic Programming. (5 marks)

QUESTION THREE

a. States four (4) properties of linear programming (4 marks)
b. Enumerate the types of model used in operation research (5 marks)
c. A farmer has 100 acres on which to plant two crops: corn or wheat. To produce these crops, there are certain expenses as shown in the table.

Item	Cost per Acre (#)
Corn	
Seed	12
Fertilizer	58
Planting/care/harvesting	50
Total	120
Wheat	
Seed	40
Fertilizer	80
Planting/care/harvesting	90
Total	210

After the harvest, the farmer must store the crops awaiting proper market conditions. Each acre yields an average of 110 bushels of corn or 30 bushels of wheat. The limitations of resources are as follows:

Available capital: #15,000.

Available storage facilities: 4,000 bushels.

If net profit (the profit after all expenses have been subtracted) per bushel of corn is #1.30 and for wheat is #2.00, how should the farmer plant the 100 acres to maximize the profits?(6 Marks)

QUESTION FOUR

a. Explain and justify the Transportation Problem. (5 marks)
b. Analyze Dynamic Programming Approach. (5 marks)
c. Appraise the assumptions of linear programming (5 marks)

QUESTION FIVE

a. Relate Maximization and the Transportation Techniques(6 marks)

b. Assuming a manufacturing company own by Dr. Abanihi and Engr. Momoh is to produce three products A, B and C. Three resources R1, R2 and R3 are required to make these products. Each units of A requires 1 unit of R1, 3units of R2 and 3 units of R3. Each Unit of Product B requires 1 unit of R1, 4 units of R2 and 2 units of R3. Each unit of product C requires 2 unit of R1, 5 units of R2 and 3 units of R3. Both Professors has 5 units of R1, 12 units of R2 and 7 units of R3 available.

   The manufactures also make a profit of

   8 Naira per unit of product A sold

   3 Naira per unit of product B sold and

   13 Naira per unit of product C sold

   Formulate a linear programming problem for this situation (6 Marks)

c. In succinct term, what is integer programming? (3 Mark)

QUESTION SIX

a. Draw the flow diagram showing the stages in operations research (5 Marks)

b. List four limitations of Operations Research. (4 Marks)

c. Appraise the term feasible solution? (3 Marks)

d. Justify constraints as related to operation research? (3 Marks)