"Investing in Africa's Future"

COLLEGE OF BUSINESS PEACE LEADERSHIP AND GOVERNANCE

NMMS 409: OPERATIONS RESEARCH

END OF SECOND SEMESTER EXAMINATIONS

APRIL/MAY 2022

LECTURER: Dr. Maune /Mr. Makambwa

DURATION: 3 HOURS

INSTRUCTIONS

Answer **ALL** the questions in **Section A** and any Three questions from Section B and each question has **20** marks. Total possible mark is **100.**

Start **each** question on a new page on your answer sheet.

The marks allocated to **each** question are shown at the end of the section.

SECTION A – (Compulsory 40 Marks)

Answer all questions in this Section

QUESTION ONE

Operations Research uses any suitable tools or techniques available. The common frequently used tools/techniques are mathematical procedures, cost analysis, electronic computation. However, operations researchers have given special importance to the development and the use of techniques like linear programming, game theory, decision theory, queuing theory, inventory models, and simulation. In addition to the above techniques, some other common tools are non-linear programming, integer programming, dynamic programming, sequencing theory, Markov process, network scheduling (PERT/CPM), symbolic Model, information theory, and value theory. There are many other Operations Research tools/techniques also exists. With the aid of examples discuss the following techniques/tools:

a) Linear Programming
b) Game Theory
c) Decision Theory
d) Queuing Theory
e) Inventory Models
f) Simulation
g) Markov Process
h) Network Scheduling
i) Program Evaluation and Review Technique (PERT).
j) Critical Path Method (CPM)

[40]

SECTION B

Answer any three questions from this Section

QUESTION TWO

A company owns two flour mills viz. A and B, which have different production capacities for high, medium and low quality flour. The company has entered a contract to supply flour to a firm every month with at least 8, 12 and 24 quintals of high, medium and low quality respectively. It costs the company Rs.2000 and Rs.1500 per day to run mill A and B respectively. On a day, Mill A produces 6, 2 and 4 quintals of high, medium and low quality flour, Mill B produces 2, 4 and 12 quintals of high, medium and low quality flour respectively. How many days per month should each mill be operated in order to meet the contract order most economically. **[20]**

QUESTION THREE

A juice company has its products viz. canned apple and bottled juice with profit margin Rs.4 and Rs.2 respectively pre unit. The following table shows the labour, equipment, and ingredients to produce each product per unit.

	Canned Apple	Bottled Juice	Total
Labour	2.0	3.0	12.0
Equipment	3.2	1.0	8.0
Ingredients	2.4	2.0	9.0

Formulate the linear programming problem (model) specifying the product mix which will maximize the profit without exceeding the levels of resources. **[20]**

QUESTION FOUR

A bed mart company is in the business of manufacturing beds and pillows. The company has 40 hours for assembly and 32 hours for finishing work per day. Manufacturing of a bed requires 4 hours for assembly and 2 hours in finishing. Similarly a pillow requires 2 hours for assembly and 4 hours for finishing. Profitability analysis indicates that every bed would contribute Rs.80, while a pillow contribution is Rs.55 respectively. Find out the daily production of the company to maximize the contribution (profit). **[20]**

QUESTION FIVE

A company has three factories located in three cities viz. X, Y, Z. These factories supplies consignments to four dealers viz. A, B, C and D. The dealers are spread all over the country. The production capacity of these factories is 1000, 700 and 900 units per month respectively. The net return per unit product is given in the following table.

		Dealers			
Factory	A	B	C	D	**capacity**
	6	6	6	4	X 1000
	4	2	4	5	Y 700
	5	6	7	8	Z 900
Requirement	900	800	500	400	2600

Determine a suitable allocation to maximize the total return. **[20]**

QUESTION SIX

The main problem of inventory control is to answer two questions namely:

1. How much to order? and
2. When to order?

These questions are answered by developing an inventory model, which is based on the consideration of the main aspects of inventory namely demand and cost. There are many factors related to these two main factors (Demand and Cost). Explain different factors that affect the inventory. **[20]**

QUESTION SEVEN

a) Suppose an industry is manufacturing two types of products P1 and P2. The profits per Kg of the two products are $30 and $40 respectively. These two products require processing in three types of machines. The following table shows the available machine hours per day and the time required on each machine to produce one Kg of P1 and P2.

Profit/Kg	P1 $30	P2 $40	Total available Machine hours/day
Machine 1	3	2	600
Machine 2	3	5	800
Machine 3	5	6	1100

Formulate the problem in the form of linear programming model. [10]

b) Describe the relationship between the manager and operations research specialist. [10]

QUESTION EIGHT

a) Discuss the methods used to determination the basic feasible solution and the optimum solution in the transportation problem. [10]

b) Explain the various steps in the operations research development process. [10]

a) A manufacturer uses $20, 000 worth of an item during the year. The manufacturer estimated the ordering cost as $50 per order and holding costs as 12.5% of the average inventory value.

Find;

(i) the optimal order size (4 marks)
(ii) number of orders per year (4 marks)
(iii) time period per order (4 marks)
(iv) total cost (3 marks)

b) Describe different techniques/tools of operations research. (10 marks)

END OF EXAMINATION