GARY MAGADZIRE SCHOOL OF AGRICULTURE AND ENGINEERING

DEPARTMENT OF SOIL AND PLANT SCIENCES

BACHELOR OF SCIENCE DEGREE IN IRRIGATION AND WATER ENGINEERING
LEVEL 3 SEMESTER 1

EXAMINATION PAPER

MODULE CODE: AIWE 314

MODULE NARRATION: ENGINEERING QUANTITATIVE TECHNIQUES

DATE:

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

Section A is COMPULSORY. Answer all questions in Section A

Answer ANY THREE questions in Section B

Each question in section B carries 20 marks

SECTION A. Answer ALL questions. This section carries 40 marks.

QUESTION 1

(a) Discuss the 5 characteristics of linear programming. [10]

(b) Discuss how Pareto analysis used in Stock Control. [10]

QUESTION 2

Chipfiyamiti Pvt (Ltd) is an investment company doing an analysis of the pension fund for a certain company. A maximum of $10 million is available to invest in two places. No more than $8 million can be invested in stocks yielding 12% and at least $2 million can be invested in long-term bonds yielding 8%. The stock-to- bond investment ratio cannot be more than 1 to 3. How should Big Bros. advise client so that the pension fund will receive the maximum yearly return on investment? Formulate the LP model. [20]

Plants	Warehouses				Monthly capacity
	A	*B*	*C*	*D*	
X	3	16	9	2	40
Y	1	9	3	8	20
Z	4	5	2	5	50
Monthly demand	25	25	42	8	110 / 100

SECTION B: Answer three questions. Each question carries 20 marks.

QUESTION 3

(a) Explain the steps of formulating a simplex model [4]

(b) A company can produce 3 products A, B and C. The products yield a contribution of $8, $5 and $10 respectively. The products use a machine which has 400hours capacity in the next period. Each unit of the products uses 2, 3 and 1hr respectively of the machine's capacity. There are only 150 units available in the period of a special component which is used singly in products A and C, 200kgs only of a special alloy is available in the period. Product A uses 2kgs per unit and product C uses 4kgs per unit. There is an agreement with a trade association to produce no more than 50 units of product B in the period. The company wishes to find out the production plan which maximizes contribution. [16]

QUESTION 4

A company presently operates three manufacturing plants that distribute a product to four warehouses. Currently, the capacity of the plants and the demands of the warehouses are stable. These are listed with the unit shipping costs in the following table.

Find the optimal distribution plan for the company. [20]

QUESTION 5

DM manufacturing company is specialising in beverage products. The company is failing to satisfy the demand of the project market due to unavailability of stock. The manager decided to hold stock. Justify his decision. [20]

QUESTION 6

The operations manager of DM Chipfunde Engineering Pvt (Ltd) intends to construct a mechanical engineering plant to do the maintenance of Irrigation equipment and machinery for the company. He has advertised the post for an operations manager. Write a detailed memo to him marketing your expertise. [20]

QUESTION 7

DM Engineering firm of office equipment suppliers has 3 depots located in various towns. It receives orders for a total of 15 special filing cabinets from 4 customers. In total in the 3 depots there are 15 of the correct filing cabinets available and the management wish to minimize delivery costs by dispatching the filing cabinets from the appropriate depot for each customer. Details of the availabilities, requirements and transport costs per filing cabinet are given in the following table. As an engineer help the management minimize delivery cost. [20]

		Customer A	**Customer B**	**Customer C**	**Customer D**	**Total Required**
	Cabinets	3	3	4	5	**15**
Depot X	2	13	11	15	20	
Depot Y	6	17	14	12	13	
Depot Z	7	18	18	15	12	
Total Available	**15**					

END OF EXAMINATION PAPER