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DMI-ST. EUGENE UNIVERSITY

ZAMBIA

DEGREE EXAMINATION – JUNE 2023

Semester: VII **552MA71 OPERATIONS RESEARCH**

Time: 3:00 Hours **Max. Marks: 100**

Answer any FIVE Questions (5 x 20 = 100 Marks)

1. a) Explain the four basic assumptions are necessary for all linear programming models. **(5 Marks)**

   b) On completing the construction of house a person discovers that 100 square feet of plywood scrap and 80 square feet of white pine scrap are in useable for the construction of tables and book cases. It takes 16 square feet of plywood 8 square feet of white pine to make a table, 12 square feet of plywood and 16 square feet of white pine are required to construct a book case. By selling the finishing duct to a local furniture store the person can realize a profit of K. 25 on each table d K. 290 on each book case. How may the man most profitably use the left over wood? Use graphical method to solve problem. **(15 Marks)**

2. a) How do Solve Transportation Problem? **(5 Marks)**

   b) List out the Procedure for North West Corner Method. **(5 Marks)**

   c) Find the optimum solution to the following problem **(10 Marks)**

From	I	3	4	6	8	8	20
	II	2	10	1	5	30	30
	III	7	11	20	40	15	15
	IV	2	1	9	14	18	13
		40	6	8	18	6	

   Find basic feasible solution (VAM Method)

3. a) Find out the time required to complete the following project and the critical activities: **(15 Marks)**

Activity	Predecessor Activity	Optimistic time estimate (t_o days)	Most likely time estimate (t_m days)	Pessimistic time estimate (t_p days)
A	-	2	4	6
B	A	3	6	9
C	A	8	10	12
D	B	9	12	15
E	C	8	9	10
F	D, E	16	21	26
G	D, E	19	22	25
H	F	2	5	8
I	G	1	3	5

b) The following details are available regarding a project:

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

(5 Marks)

4. a) John Industry needs 5,400 units/year of a bought-out component which will be used in its main product. The ordering cost is K 250 per order and the carrying cost per unit per year is K 30. Find the economic order quantity (EOQ), the number of orders per year and the time between successive orders. **(10 Marks)**

   b) Alpha Industry needs 15,000 units per year of a bought out component which will be used in its main product. The ordering cost is K125 per order and the carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is K75. Find economic order quantity, number of orders per year and time between successive orders.

   (10 Marks)

5. a) A bag contains 3 red and 4 white balls. Two draws are made without replacement. What is the probability that both the balls are red? **(5 Marks)**

   b) Find the probability of drawing a queen and a king from a pack of cards in two consecutive draws, the cards drawn not being replaced. **(5 Marks)**

   c) The Zambia daily mail newspaper publishes three columns entitled politics (A), Books Cinema (C). Reading habits of a randomly selected reader with respect to these columns are

Read regularly	*A*	*B*	*C*	$A \cap B$	$A \cap C$	$B \cap C$	$A \cap B \cap C$
Probability	*0.14*	*0.23*	*0.37*	*0.08*	*0,09*	*0.13*	*0.05*

(10 Marks)

6. a) A truck can carry a total of 10 tons of product. Three types of products are available for shipment. Their weight and values are tabulated. Assuming that at. Least one of each type must be shipped. Determine the loading which will maximize the total value. Formulate the problem. Use simplex method to solve problem

Type	Value (Rs)	Weight (tons)
A	20	1
B	50	2
C	60	2

(**10 Marks)**

b) Use simplex method to solve the LPP. Maximize $Z = 2x_1 - 4x_2 + 5x_3 - 6x_4$

Subject to constraint

$$x_1 + 4x_2 - 2x_3 + 8x_4 \leq 2$$
$$-x_1 + 2x_2 + 3x_3 + 4x_4 \leq 1$$
$$x_1, x_2, x_3, x_4 \geq 0$$

(10 Marks)

7. a) Write out the Steps For Vogel's Approximation Method (VAM). **(5 Marks)**

b) Find the optimal assignment for the assignment problem of Hungarian with the following cost matrix. **(15 Marks)**

	I	II	III	IV
A	5	3	1	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	6