UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MA 487 Unihubgh.com

COURSE NAME: MATHEMATICAL PROGRAMMING

CLASS: MA 1V **TIME:** 3 HOURS

Name**:** _____ Index Number: _____

Answer ALL questions in the answer booklet provided

1. Using the simplex method

   Minimize

   $$60x_1 + 70x_2$$

   Subject to

   $$2x_1 + x_2 \geq 300$$
   $$3x_1 + 4x_2 \geq 509$$
   $$4x_1 + 7x_2 \geq 812$$
   $$x_1, x_2, s_3, s_4, s_5 \geq 0$$

   [10 marks]

2. An organization is interested in the analysis of two products which can be produces from the idle time of labour, machine and investment. It was notified on investigation that the labour requirement of the first and the second products was 4 and 5 units respectively and the total available man hours was48. Only first product required machine hour utilization of one hour per unit and at present only 10 spare machine hours are available. Second product needs one unit of byproduct per unit and the daily availability of the byproduct is 12 units. According to the marketing department the sales potential of first product cannot exceed 7 units. In a competitive market, first product can be sold at a profit of Rs.6 and the second product at a profit of Rs.10 per unit. Formulate the problem as a linear programming model. Also determine graphically the feasible region. Identify the redundant constraints if any.

   [10 marks]

3. Use the graphical method to

   Minimize

   $$2000x_1 + 1500x_2$$

   Subject to:

   $$6x_1 + 2x_2 \geq 8$$
   $$2x_1 + 4x_2 \geq 12$$
   $$4x_1 + 12x_2 \geq 24$$
   $$x_1 \geq 0, x_2 \geq 0$$

   [10 Marks]

4. A tourist company owns a one car in each of the five locations viz. l_1, l_2, l_3, l_4 and l_5 a passenger in each of the five cities c_1, c_2, c_3, c_4 and c_5 respectively. The following table shows the distant between the locations and cities in kilometer. How should be cars be assigned to the passengers so as to minimize the total distance covered.

		CITIES				
		C_1	C_2	C_3	C_4	C_5
LOCATION	L_1	120	110	115	30	36
	L_2	125	100	95	30	16
	L_3	155	90	135	60	50
	L_4	160	140	150	60	60
	L_5	190	155	165	90	85

[10 Marks]

5. The ABT transport company ships truckloads of food grains from three sources viz. X, Y, Z to four mills viz. A, B, C, D respectively. The supply and the demand together with the unit transportation cost per truckload on the different routes are described in the following transportation table. Assume that the unit transportation costs are in hundreds of dollars. Determine the optimum minimum shipment cost of transportation using MODI method.

Source	**Destination**				
	A	B	C	D	Supply
S1	10	2	20	11	15
S2	12	7	9	20	25
S3	4	14	16	18	10
Demand	5	15	15	15	

[15 marks]

6. An organization has three plants at X, Y, Z which supply to warehouses located at A, B, C, D, and E respectively. The capacity of the plants is 800, 500 and 900 per month and the requirement of the warehouses is 400, 400, 500, 400 and 800 units respectively. The following table shows the unit transportation cost.

X	\$5	\$8	\$6	\$6	\$3
Y	\$4	\$7	\$7	\$6	\$6
Z	\$8	\$4	\$6	\$6	\$3

Determine an optimum distribution for the organization in order to minimize the total cost of transportation.

[15 marks]

Examiner: Henry Otoo