TECHNICAL UNIVERSITY OF MOMBASA

UNIVERSITY EXAMINATIONS DECEMBER 2016

EXAMINATION FOR THE DEGREE OF
BACHELOR OF COMMERCE YR4 SEM1

BMS 4401: MODEL BUILDING IN MATHEMATICAL PROGRAMMING

DATE: DECEMBER 2016 **DURATION:** 2 HOURS

ANSWER QUESTION ONE AND ANY OTHER TWO

QUESTION ONE

a) State FOUR benefits of model building (8 marks)

b) Njuguna and Chirchir company produces three products A, B and C. The firm uses two types of raw materials I and II of which 5,000 and 7,500 units respectively are available materials requirements per unit of product are given below

Raw material	Requirement per unit product		
	A	B	C
1	3	4	5
11	5	3	5

The labour time for each unit product A is twice that of B and three times that of product C. the entire labour force of the firm can produce the equivalent of 3,000 units. The minimum demand of the three products is 600, 650 and 500 units respectively. Also the ratios of the number of units produced must be equal to 2:3:4. Assuming the profit per unit of A, B and C as ksh.50, 50 and 80 respectively.

Required:

Formulate the problem as a linear programming model in order to determine the number of units of each product, which will maximize the profit. (12 mks)

a) Explain the meaning of the following terminologies as used in network analysis
   i. Activity (2½ mks)
   ii. Dummy activities (2½ mks)
   iii. Event (2½ mks)
   iv. Floats (2½ mks)

QUESTIONS TWO

a) Explain the role of Network analysis in business (8 mks)

b) Construct a PERT diagram from the following information and determine the critical path (12 mks)

Activity	**Immediate predecessor**	**Duration**
A	-	2
B	A	4
C	A	6
D	B	8
E	C	6
F	C	10
G	E	10
H	F	14
I	G,H	8
J	G,H	12
K	I	4
L	J	10

QUESTION THREE

a) Discuss any FOUR assumptions of a linear programming model (8 mks)

b) Mathematical modeling basically is a three stages process. Discuss the stages involved in mathematical modeling (12 mks)

QUESTION FOUR

a) Describe the structure of an AMPL model (10 mks)

b) Solve the following linear programming equation graphically by finding the feasible solution area (10 mks)

$Max\ Z = 80x_1 + 120x_2$

Subject to constraints

$$x_1 + x_2 \begin{matrix} \leq 9 \\ \geq 2 \end{matrix}$$

$$x_2 \geq 3$$

$$20x_1 + 50x_2 \leq 360$$

$$x_1, x_2 \geq 0$$

QUESTION FIVE

A rubber company is engaged in producing three different tyres A, B and C. Thesetyres are produced at the company's two plants which have different production capacity. In a normal 8 hour day, plant one can produce 50,100 and 100 tyres of types A, B and C respectively while plant 2 can produce 60 tyres of type A, 60 tyres of type B and 200 of type C. The monthly demand of tyres of type A, B and C is 2500, 3000 and 700 units respectively. The daily cost of operation of plant 1 is ksh.2500 and that of plant 2 is 3500.

Required:

a) Identify the appropriate management objective of the rubber company (3 mks)
b) Basedon the management objective identified formulate the linear programming model (10 mks)
c) Use appropriate technique to solve the linear programming problem (4 mks)
d) Interpret the results obtained after solving the linear programme problem (3 mks)