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**TECHNICAL UNIVERSITY OF MOMBASA**

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SCHOOL OF BUSINESS

DEPARTMENT OF MANAGEMENT SCIENCE

**UNIVERSITY EXAMINATION FOR:**

DIPLOMA IN PROCUREMENT AND MATERIALS MANAGEMENT

DIPLOMA IN LOGISTICS AND TRANSPORT MANAGEMENT

DIPLOMA IN HUMAN RESOURCES MANAGEMENT

DIPLOMA IN BUSINESS ADMINISTRATION

DIPLOMA IN SALES & MARKETING MANAGEMENT

DIPLOMA IN BUSINESS MANAGEMENT

DIPLOMA IN ACCOUNTANCY

DIPLOMA IN FRONT OFFICE

**BAC 2201 : QUANTITATIVE TECHNIQUES**

END OF SEMESTER EXAMINATION

**SERIES: AUGUST 2019**

**TIME: 2**

**DATE: Pick Date Aug**

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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**Question ONE**

- a) A firm produces two products x and y with a contribution of ksh.50 and 60 per unit respectively. Production data is as follows per unit

	Labour hrs	production hrs	processing hrs
X	4	3	5
Y	3	2	6
Total available	1200	1500	2400

Formulate the Problem as a linear program (5marks)

b) Determine the inverse E

$$E = \begin{pmatrix} 4 & 2 & 6 \\ 2 & 5 & 0 \\ 1 & 2 & 1 \end{pmatrix} \quad (10marks)$$

c) (i) Find the derivative  $Y = 4x^4 - 5x^2 + 4x^3 - 15x$  (3marks)

(ii) Integrate  $\int (5x^4 - 4x^3 + 2x - 6) dx$  (2marks)

d) An employee who received fixed annual increments had a final salary of ksh 60000 p.a after 10 yrs. if his total salary was 510000 over 10 yrs, what was his initial salary? (5marks)

e) Given the initial value of a geometric progression is 4 and the common ratio is 6 find the first FIVE terms of the series (5marks)

### Question TWO

a) a) Wakali equipment suppliers ltd have three depots allocated in different towns. It receives orders for 15 cabinets from four customers. The capacities for depot x, y and z are 2, 6 and 7 respectively while demands for customers a, b, c and d are 3, 3, 4 and 5 respectively. The detail for transport costs per cabinet is as follows

	Customer a	Customer b	Customer c	Customer d
Depot x	13	11	15	12
Depot y	17	14	12	13
Depot z	18	10	13	12

Using any method find the optimal solution which minimizes transportation cost (10marks)

b) A firm wishes to undertake a project whose activities and project durations are given as follows;

Activity	Predecessor	Duration [Months]
A	-	3
B	-	4
C	A	3
D	A,B	6
E	A	5
F	A,B	3
G	C	3
H	D,E	2
J	F	4
K	G,H,J	3

**Required**

- i. Draw a network diagram for the project (6marks)
- ii. Determine the project duration and the critical activities (4marks)

**Question THREE**

a) Solve the following simultaneous equations using inverse method

$$5x+2y-2z=3$$

$$4x+3y-z=7$$

$$3x-2y+3z=8$$

(14marks)

a) A firm rents its premises and a rental agreement provides for regular annual increase of ksh 125000, if rent in the first year is ksh525000. What is the rent in the 12<sup>th</sup> year? (6marks)

**Question FOUR**

- a) Explain Any **FIVE** requirements of linear programming problem? (5marks)
- b) XYZ Ltd produces two products Alpha and Beta using the same raw material, labour and machinery. Alpha and Beta contributes ksh.30 and 40per unit respectively. Details of the products are given below:

<u>Resources/Unit</u>	Alpha	Beta	<u>Maximum/week</u>
Machine hours	3	2	1200 hours
Labour hours	4	3	1500 hours
Material input [Q]	1	1	500 kg

The maximum weekly demand of product Beta is 300 units .using graphical method.

**Required**

- (i) Formulate the above as a LP problem (6marks)
- (ii) Determine the optimal level of output of each product per week. (9marks)

**Question FIVE**

a) Victors Ltd manufactures a single product. The demand curve for the product is given by the equation:  $P = 5\,600 - 4Q$ , where P is the selling price per unit in shillings and Q is the number of units sold The **average** cost per month is given by the equation:

$$AC = 164\,000/Q - 700 + 2Q$$

Required determine the total revenue (TR) and the total cost (TC) functions (4marks) and then find;

- a) the quantity that maximizes total revenue (3marks)
  - b) the maximum total revenue (2marks)
  - c) the profit function (2marks)
  - d) the quantity that maximizes profit (2marks)
  - e) the maximum profit (2marks)
- b) A firm buys a power saw for ksh 125000, which is expected to last for 20yrs and have a scrap value of ksh 25000. If depreciation is on straight-line method how much should be provided for each year? (5marks)