



**TECHNICAL UNIVERSITY OF MOMBASA**

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SCHOOL OF BUSINESS

MANAGEMENT SCIENCE

**UNIVERSITY EXAMINATION FOR:**

BACHELOR OF COMMERCE

BMS 4101: MANAGEMENT MATHEMATICS 1

END OF SEMESTER EXAMINATION

**SERIES: JANUARY – APRIL 2022**

**TIME: TWO HOURS**

**DATE: APRIL 2022**

**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 and any other two questions

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

1(a) A survey was conducted on the newspaper readership of 3 dailies; the Mirror, the Citizen and the Times, M, C, T respectively and the following data was obtained:

The number of people who read M, C & T was found to be 55, 45 and 39 respectively.

The number that read M & T = 19

The number that read C & M = 15

The number that read C & T = 14

Those who read all the 3 were found to be 4 people only.

**Required:**

Determine the number of people who:

(i) Read the Mirror only. [2Marks]

(ii) Read Citizen or Times but not the Mirror [2Marks]

(iii) The total number of people interviewed if 5 people read none of the papers. [2Marks]

(b) A manufacturer can sell a certain product for Kshs. 80 per unit. Total cost consists of a fixed overhead of Kshs 4500 and production costs of Kshs.50 per unit.

Required:

(i) Determine the total cost if 300 units are produced [3marks]

(ii) Determine the total profit if 300 units are produced and sold [3marks]

(c) A product has selling price as shs 200 whereas unit variable cost is sh. 140 the annual fixed cost is sh. 720,000. You are required to determine the following (B.E.P.)

(i) Breakeven sales units [2Marks]

(ii) Profit to be made if 20000 units are sold [2Marks]

(iii) Sales required for a profit of Sh. 2,000,000 [2Marks]

(d) The supply function of a commodity is quadratic and passes through the points shown below:

P	30	40	50
Q	500	3600	6300

Determine the supply function as  $q = f(p)$ , i.e. in the form:

$$q = a + b_1 p + b_2 p^2 \quad [5\text{Marks}]$$

(e) If  $U = 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15$  [5 Marks]

$$A = 2,5,6,9,11,14$$

$$B = 5,8,9,11,13,15$$

$$C = 2,6,11,13,14$$

What is?

i)  $A \cap B$

ii)  $A \cup B$

iii)  $B \cap C$

iv)  $A^1$

v)  $C^1$

[5 Marks]

(f) Solve the following equation

$$2(x+1) = 3^{2x} - 5 \quad [2\text{ Marks}]$$

## QUESTION TWO

- (a) A company sets up a sinking fund and invests Shs. 80,000 each year for 5 years at 9% compound interest. What will the fund be worth after 5 years?

[5 Marks]

- (b) A contractor repaired a murram road 450M long. Estimate the cost of repairing if the cost is Shs. 90 for repairing the first metre with an increase in cost of Shs. 5 per metre for each succeeding metre.

[3 Marks]

- (c) Calculate how much money should be invested now in order to acquire Shs. 360,000 after five years if the investment rate is 12%

[5 Marks]

- (d) (1)Gymnast Clothing manufactures expensive hockey jerseys for sale to college bookstores in runs of up to 150. The cost function is given as

$$C(x) = 1500 + 10x + 0.2x^2, \quad (0 \leq x \leq 150)$$

If Gymnast Clothing sells the jerseys at \$90 each.

Required: (i)Find the revenue function.

[2Marks]

(ii)Find the profit function

[2Marks]

- (e) Solve the equation

$$x^2 + 6x - 9 = 0$$

[3 Marks]

## QUESTION THREE

Q. 3 a) In a recent survey of 400 students in a college, 100 were listed as studying typing (T) and 150 were listed as doing accountancy (A). 75 were registered for both courses.

**Required:**

- (a) Find the number of students in the college who are not registered for either course.

[3 Marks]

- (b) How many students were registered for typing only?

[2 Marks]

(b) The starting salary of a certain employee at a University is Shs. 94,000 per annum. The annual increment is Shs. 3,000 per annum.

i) Calculate the salary at the end of the 8<sup>th</sup> year. [3 Marks]

ii) Calculate total earnings over this period [4 Marks]

(c) Write brief notes on [4 Marks]

i) Complement of a set

ii) Disjoint set

iii) Universal set

(iv) Subset

(d) A firm expects its revenue to grow by 13% per month. If the January revenue is Shs. 240,000. Calculate the expected total annual revenue. [4 Marks]

#### QUESTION FOUR

4(a) The demand function of company is  $p = 42 - 0.001x$  and cost function is  $C(x) = 30x + 1200$ , where  $x$  is the number of units demanded.

i. Find the profit function [2 Marks]

iii Calculate the profit for 1000 units [3 Marks]

(b) How much money should be invested now in order to acquire Shs. 540,000 after five years? The investment rate is 12%

[3marks]

(c) Calculate the sum of the first 10 terms of the geometric progression

1, 4, 16, 64, 256.....

[5 Marks]

(d) A salesman's daily wages is composed of a fixed amount and a variable component, which is dependent on the number office cream units sold. He finds that when he sells 10 units on a given day, he earns Sh 600 whereas when he doubles his sales his earnings increase by only Sh 100.

Determine:

- (i) Fixed daily earnings [2marks]
  - (ii) Level of commission per unit sold [2marks]
  - (iii) What are the salesman's earnings if he sells 30 units? [2marks]
- (e) Calculate the amount of money to invest now in order to acquire Shs. 64,000 after six years. The investment rate is 12%.

[3 Marks]

### QUESTION FIVE

5.(a) The value of XYZ Ltd's property can be described by the function

$$C(t) = 1,500,000e^{0.04(t)}$$

where C(t) is value in shillings and t is the time in years.

Required:

i) Compute the total gain in value of the property between the 2<sup>nd</sup> and the 5<sup>th</sup> year [5 Marks]

[5 Marks]

b) In an arithmetic sequence, the first term is 3 and the common difference is 6.

i) Find the 10<sup>th</sup> term of the sequence [3 Marks]

ii) Find the sum of the first 12 terms of the sequence

[3 Marks]

c) With the aid of Venn diagram, define the following set operations [3Marks]

i)  $A \cup B$

(iii)  $A^1$

ii)  $A \cap B$

(d) A principal of Shs. 34,000 is invested at 12% for 4 years. Calculate the future value if interest is compounded:

i) Annually [2 Marks]

ii) Semi-annually [2 Marks]

iii) Quarterly [2 Marks]

