



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

MATHEMATICS DEPARTMENT

UNIVERSITY EXAMINATION FOR:

UPGRADING IN MATHEMATICS PPII

AMA 1004: COMMERCIAL ARITHMETICS AND STATISTICS.

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: TWO HOURS

DATE: 30th April 2016

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.

Do not write on the question paper.

Question ONE

- (a) A Kenya company received US Dollars M. The money was converted into Kenya Shillings in a bank which buys and sells foreign currencies.

| | <u>Buying (in Ksh)</u> | <u>Selling (in Ksh)</u> |
|------------------|------------------------|-------------------------|
| 1 Sterling Pound | 125.78 | 126.64 |
| 1 Us Dollar | 75.66 | 75.86 |

- (i) If the company received Ksh.15, 132,000, calculate the amount, M received in US Dollar. (2mks)
- (ii) The company exchanged the above Kenya shillings into Sterling pounds to buy a car in Britain. Calculate the cost of the car to the nearest Sterling pound. (2mks)

- (b) Determine the integral values of x that satisfy the following inequalities.

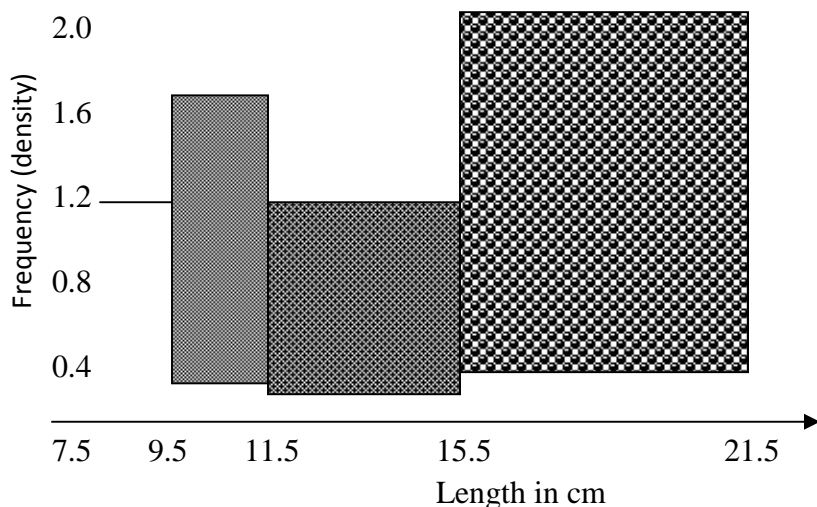
$$-18 - 3x \leq 2x - \frac{1}{2} \leq 20 - \frac{3x}{2} \quad (3\text{mks})$$

- (c) A salesman earns a basic salary of Kshs. 19,000 per month. In addition, he earns a commission

of 5% for all sales above Ks. 20,000. In February 2011, he sold goods worth 115,000.

Calculate his total earnings that month. (3 marks)

(d) The figure below shows a histogram



Complete the frequency distribution table below.

(3 marks)

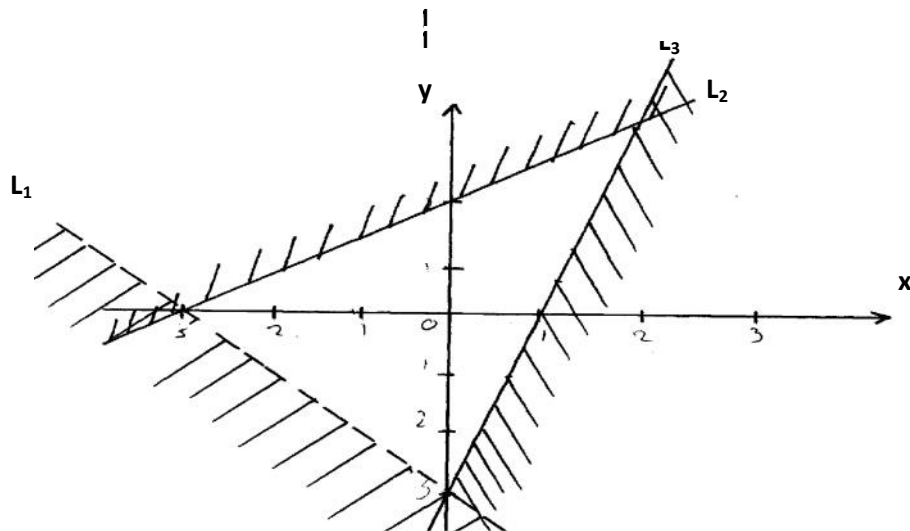
| Length x cm | Class width | Frequency density | Frequency |
|----------------------|-------------|-------------------|-----------|
| $7.5 \leq x < 9.5$ | | 1.2 | 24 |
| $9.5 \leq x < 11.5$ | | | |
| $11.5 \leq x < 15.5$ | | | |
| $15.5 \leq x < 21.5$ | | | |

(e) The probability that a day is rainy is $\frac{1}{4}$. The probability that a teacher carries an umbrella on a rainy day is $\frac{1}{7}$ and that he carries an umbrella on a non-rainy day is $\frac{2}{7}$. Find the probability that a teacher carries an umbrella. (3mks)

(f) A man invests Ksh 10000 in an account which pays 16% interest p.a. The interest is compounded quarterly. Find the interest earned after $1\frac{1}{2}$ years to the nearest shilling. (4mks)

(g) Find the quartile deviation for the data below 235, 418, 626, 405, 335, 717, 504, 609, 414, 431, 918. (2mks)

(h) Find the inequalities, L_1 , L_2 and L_3 that satisfies the region defined below; (3mks)



(i) Using Cramer's Rule to solve for the unknowns in three linear equations: (5mks)

$$5x_1 - 2x_2 + 3x_3 = 16$$

$$2x_1 + 3x_2 - 5x_3 = 2$$

$$4x_1 - 5x_2 + 6x_3 = 7$$

Question TWO

(a) The table below shows the marks scored by 40 students in a test.

| Marks | 10 – 19 | 20 – 24 | 25 – 29 | 30 – 34 | 35 – 39 | 40 - 49 |
|------------|---------|---------|---------|---------|---------|---------|
| Frequently | 3 | 4 | 7 | 10 | 9 | 7 |

(i) Calculate the mean mark. (3 marks)

(ii) Calculate the median mark. (3 marks)

(iii) Calculate the standard deviation. (4 marks)

(b) John bought a car worth Ksh. 400,000 which depreciated at the rate of 10% p.a.

(i) Find the value of the car at the end of the second year. (3 marks)

(ii) At the end of the second year he sold the car at Ksh. 350,000. Find the percentage gain over the value of the car. (3 marks)

(iii) After the purchase of the car, he deposited the remaining amount at a bank which paid an interest of 8% compound semi-annually. Find the amount in the bank to the nearest shilling at the end of the 2nd year. (4 marks)

Question THREE

(a) Two baskets X and Y contain identical balls except for the colours. Basket X contains 6 red balls and 3 black balls. Basket Y contains 2 red balls and 3 black balls.

(a) If a ball is drawn at random from each basket, find the probability that both balls are of the same colour. (4 marks)

(b) If two balls are drawn at random from each basket, one ball at a time without replacement, find the probability that:-

(i) The two balls drawn from basket X or basket Y are red. (4 marks)

(ii) All the four balls drawn are red. (2 marks)

(c) A sum of money is invested in a bank which pays compound interest at r% p.a. at the end of the first year, the sum amount to shs.17,600 and at the end of the second year it becomes shs.19,360.

(a) Find the value of r (3mks)

(b) Find the initial sum of money (2mks)

(b) Solve and write down all the integral values satisfying the inequality.

$$X - 9 - 4 < 3x - 4 \quad (5mks)$$

Question FOUR

(a) Kamene has 20 acres of land. She intends to grow maize and beans. She requires sh. 2,000 to plant an acre of maize and sh. 4,000 for an acre of beans. Twice the area to be planted with maize should not be less than the one of beans. The total capital available is sh. 60,000. The estimated profit is sh. 5,000 for an acre of maize and sh. 7,000 for an acre of beans. By letting x and y to represent the area to be planted with maize and beans respectively.

(i) Find the inequalities to represent the above information. (4 marks)

(ii) On the square grid provided, graph the above inequalities and show the region which satisfy them simultaneously. (Use the scale 3cm rep. 5 units on both axes.) (4 marks)

(iii) Determine the expected maximum profit.

(2 marks)

(b) Solve the inequalities $t \leq 2t + 7 \leq -\frac{1}{3}t + 14$ hence represent the solution on a number line.

(4mks)

(c) Use the inverse matrix method rule to solve simultaneous equations.

$$2x + y = 10$$

(3mks)

$$2x + 2y = 14$$

(d) Determine the quartile deviation of the set of numbers below.

(3mks)

8, 2, 3, 7, 5, 11, 2, 6, 9, 4

Question FIVE

(a) Mwaniki, Kamau and Kitheka started a joint Venture by contributing sh. 240,000, sh. 270,000 and sh. 300,000 respectively. They agreed that 30% of the profit made at the end of each year will be ploughed back into the business. They also agreed that 40% of the profits will cover salaries and other expenses for that year. The remainder was to be shared among the three partners in the ratio of their contributions. At the end of the first year, the business realized a gross profit of sh. 180,000.

Calculate how much each received at the end of the year.

(5 marks)

(b) Income tax is charged on annual income at the rate shown below

| Taxable income p.a (Ksh) | Rate (%) |
|---------------------------------|-----------------|
| 1 – 30000 | 10 |
| 30001 – 60000 | 15 |
| 60001 – 90000 | 25 |
| 90001 - 120000 | 35 |
| 120001 – 150000 | 45 |
| Over 150000 | 50 |

A civil servant earns a monthly basic salary of Ksh.8570. He is housed by the government and as a result, his taxable income is 15% more than his salary. He is entitled to a tax relief of Ksh. 150 per month.

i) How much tax does he pay in a year?

(6mks)

ii) From his salary, the following deductions are also made every month.

WCPS 2% basic salary

NHIF Ksh 20

Calculate the civil servants net salary per month.

(4mks)

(c) Using Cramer's Rule to solve for the unknowns in three linear equations: (5mks)

$$3x_1 + 4x_2 - 3x_3 = 5$$

$$3x_1 - 2x_2 + 4x_3 = 7$$

$$3x_1 + 2x_2 - x_3 = 5$$