



KENYATTA UNIVERSITY

EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY

(BPharm Level I)

SMA 110: MATHEMATICS AND STATISTICS

1ST SEMESTER 2021/2022

TIME: 3 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTION A AND ONLY ONE QUESTION IN SECTION B.

SECTION A

QUESTION ONE (15 marks)

- a) The polynomials $f(x) = x^3 + 4x^2 - 5x + n$ and $g(x) = x^3 + 2x + 17$ leaves the same remainder when divided by $x + 1$. Solve for the value of n . (3mks)
- b) Find the set of values of x for which $6 + x > 12x^2$. (3mks)
- c) Find the values of z which satisfy $z^2 + 1 = 0$. Hence factorize $z^2 + 1$. (4mks)
- d) Solve (2mks)
- $${}^5P_3 + {}^5C_3 +$$
- e) Obtain the first four terms of the expansion of $(1 - 16x)^{1/4}$. Substitute $x = 0.0001$ and use the first two terms to find the value of $\sqrt[4]{39}$. (3mks)

QUESTION TWO (15 marks)

- a) Differentiate the following functions
- i. $y = \sqrt{2 - \sqrt{2 - x}}$ (2mks)
- ii. $y = x^2 \sin 2x$ (2mks)
- b) If $x^2 - xy + y^2 = 9$, find $\frac{d^2y}{dx^2}$ (2mks)
- c) Find y'' given that $y = e^x \ln x$ (2mks)

d) Evaluate the following limit

a) $\lim_{x \rightarrow 2} \frac{x^2 + 4x - 12}{x^2 - 2x}$

b) $\lim_{t \rightarrow \infty} \frac{3x^2 - 6x}{4x - 8}$

(4mks)

2. Differentiate from first principles $y = \frac{2}{x+1}$

(3mks)

QUESTION THREE (15 marks)

(a) The contents of 80 boxes of syringes were counted and the results were recorded:

Number of syringes	Frequency	Cumulative frequency	Relative frequency
46	4		
47	8		
48	10		
49	14		
50	15		
51	13		
52	10		
53	6		

(i) Complete the table.

(2 marks)

(ii) How many boxes contained less than 50 syringes?

(1 mark)

(iii) How many boxes contained between 48 and 52 syringes?

(1 mark)

(iv) What proportion of the boxes contained 50 syringes?

(1 mark)

(b) A box contains 7 red capsules and 5 green capsules. Three capsules are drawn at random from the box one at a time without replacement. What is the probability that

(i) the first two are red and the third one is green (2 marks)

(ii) at least one green capsule is chosen (2 marks)

(iii) at most two red capsules are chosen. (2 marks)

(c) 31 pharmacy students tried to estimate the length of a capsule. The capsule was actually 60mm long. These are their results in millimeters.

61	70	46	44	26	23	30	83	52	44	38	37
49	59	58	63	31	29	37	48	76	61	46	31
38	41	49	52	56	75	61					

Find the median and the quartiles of this distribution and use the quartiles to estimate the skewness. (4 marks)

QUESTION FOUR (15 marks)

- Justify why the computer is called a digital computer. (1 mark)
- Mention four out of the five categories of computers. (2 marks)
- Draw a flowchart indicating the functional units of a computer. (4 marks)
- Mention two characteristics each of first-generation computers and second-generation computers. (2 marks)
- Give two reasons why every information in the computer is represented as binary patterns. (2 marks)
- List four areas where computer automation has influenced our society. (2 marks)
- Explain how the instruction given below is executed in a computer;

ADD LOCA, R0 (2 marks)

SECTION B

QUESTION FIVE (10 marks)

- a) By use truth table, show whether the proposition $\sim(p \vee q) \vee (\sim p \wedge q) \vee p$ is a tautology, contradiction or neither. (3mks)
- b) Out of 100 lorries stopped by police at a roadblock, 60 were passed as satisfactory. Each of the remaining 40 had faults in brakes (B), light (L) and steering wheel (S). The police found out that
- $$n(B) = 12, n(B \cap L \cap S) = 3, \quad n(B^c \cap L \cap S) = 2, \quad n(B \cap S) = n(L \cap S)$$
- $$n(B \cap L \cap S^c) = 1, \quad n(B^c \cap L^c \cap S) = n(B^c \cap L \cap S^c)$$
- How many lorries had only one fault and how many had faulty lights? (4mks)
- c) Express $2 - i\sqrt{3}$ in modulus- argument form. (3mks)

QUESTION SIX (10 marks)

- a. Differentiate $y = \frac{e^{2x} \ln x}{2x+1}$ (1mk)
- b. Use differentials to approximate $\cos 31^\circ$ (2mks)
- c. Find the equation of the normal line to the curve $y = 2x^2 - 3$ at $x = 0$ (3mks)
- d. Sketch the region enclosed by the curve $y = x(x-1)(x-2)$. (2mks)
- e. 46200cm^2 of material is available to make a cylindrical water tank with an open top. Find the radius and the height of the tank if it is to have the largest volume. (2mks)

QUESTION SEVEN (10 marks)

The table below shows the number of hours X and the number of bacteria per unit volume Y present in a culture.

Hours X	Number of bacteria per unit volume Y
0	32
1	47
2	65
3	92
4	132
5	190

6	275
---	-----

(a) Obtain the least squares regression line of Y on X .

(8 marks)

(b) Interpret the gradient in terms of hours and bacteria per unit volume.

(2 marks)