



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR BACHELOR OF SCIENCE
IN AGRICULTURAL EDUCATION AND EXTENSION

KCU 101: FUNDAMENTALS OF MATHEMATICS

DATE: 6/12/2017

TIME: 2.00-4.00 PM

INSTRUCTIONS : Answer Question One And Any Other Two.

QUESTION ONE (30 MARKS)

- a) Solve the following quadratic equation $x^2 - 2x - 1 = 0$. (4 marks)
- b) Find the values of y which satisfy the inequality $2y - 16 > 17y + 5$ (2 marks)
- c) Solve the following system of linear equations using Gauss-Jordan elimination method.

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

$$2x + 3y + 4z = 20$$

$$4x + 3y + 2z = 16 \quad (5 \text{ marks})$$

- d) Evaluate the following integral

(i) $\int (3x + 2)^5 dx$

(3 marks)

(ii) $\int \frac{dx}{(4x+1)^4}$

(3 marks)

- e) Find the following derivatives

i. $f(x) = \frac{2}{5x-4}$ (2 marks)

ii. $f(x) = (2x - 1)^{10}$ (2 marks)

iii. $f(x) = (x^2 + x + 1)(10x - 5)^8$ (2 marks)

f) What is the value of x such that $\ln(8x - 5) = 20$ (3 marks)

g) The table below shows the masses of 40 students in a class.

| | | | | | |
|-----------|---------|---------|---------|---------|---------|
| Mass (kg) | 40 – 44 | 45 – 49 | 50 – 54 | 55 – 59 | 60 – 64 |
| Frequency | 6 | 12 | 13 | 5 | 4 |

(i) State the modal class (1 mark)

(ii) Calculate the median mass (3 marks)

QUESTION TWO (20 MARKS)

(a) The table below shows the number of defective bolts from 40 samples.

| | | | | | | |
|----------------------------|----|---|---|---|---|---|
| No. of defective bolts (x) | 0 | 1 | 2 | 3 | 4 | 5 |
| Frequency | 18 | 7 | 6 | 5 | 3 | 1 |

Calculate the standard deviation. (7 marks)

(b) Find the variance of the following set of numbers; 12, 6, 7, 9, 15, 13, 18, 11. (5 marks)

(c) If the demand function for a commodity is given by the equation $p^2 + 4q = 1600$, and the supply function is given by the equation $550 - p^2 + 2q = 0$, find the equilibrium quantity and price. (8 marks)

QUESTION THREE (20 MARKS)

(a) With the help of exponents, simplify the following algebraic expressions:

(i) $\frac{2x^4y^3}{8y^5x^2}$ (2 marks)

(ii) $\frac{z^3(y\sqrt{x})^2}{xyz}$ (2 marks)

(b) Evaluate the following definite integrals

(i) $\int_2^3 (2x - 1)^3 dx$ (2 marks)

(ii) $\int_1^2 \frac{dx}{\sqrt{5x-1}}$ (3 marks)

(iii) $\int_0^1 \frac{dx}{(3x+1)^4}$ (3 marks)

- (c) If the profit in thousand of dollars, based on both cost and potential sales for manufacturing military helicopters is given by the formula $p(n) = 360 + 174n - 3n^2$. Find the number of helicopters that maximize the profit by completing the square. (5 marks)
- (d) Solve the equation $e^{2x+3} = 10$ (3 marks)

QUESTION FOUR (20 MARKS)

- (a) Evaluate the following integral
- (i) $\int \frac{xdx}{(x^2+1)^3}$ (3 marks)
- (ii) $\int (2x^3 + 1)^4 x^2 dx$ (3 marks)
- (b) The velocity of a moving point changes according to the equation $v = (3t^2 + 2t + 1)m/s$. Find the path covered by the point during 10 seconds from the start. (4 marks)
- (c) Use Gaussian elimination method to solve the following system of equations
- $$\begin{aligned} x + 2y + z &= 5 \\ 2x + 3y + 4z &= 13 \\ 4x + 3y + 2z &= 11 \end{aligned}$$
- (5 marks)
- (d) F(x) is a polynomial in x with the following functional values; f(2)=f(3)=27, f(4)=78, f(5)=169. Find the function f(x). (5 marks)

QUESTION FIVE (20 MARKS)

- (a) Veterinary reseachers were experimenting with a new drug on fowls in a research station. A sample of fowls which were known to have the disease was used. In this sample 30 fowls were treated with the drug and the remaining 18 fowls were not treated. Calculate the probability that a fowl selected at random from the sample is;
- (i) treated with the drug. (1 mark)
- (ii) not treated with the drug. (1 mark)
- (b) The probability that a fowl treated with the drug will die is $\frac{1}{10}$ while the probability that one which is not treated will die is $\frac{7}{10}$. Calculate the probability that a fowl picked at random from the sample is;
- (i) Treated with the drug and will die. (2 marks)

- (ii) Not treated with the drug and will die. (2 marks)
- (iii) Treated with the drug and will not die. (2 marks)
- (iv) Not treated with the drug and will not die. (2 marks)
- (b) The marks obtained by 10 pupils in a test were 15, 14, 12, 13, p, 16, 11, 13, 12 and 17. The sum of the squares of the marks $\sum x^2$ is 1,794.
- (i) Calculate the value of p. (2 marks)
- (ii) the standard deviation. (3 marks)
- (c) A box contains 6 yellow ball, 4 white balls and 2 blue balls, all balls being similar in shape. A ball is picked at random without replacement and its colour noted. Use a tree diagram to determine the probability that at least one of the first two balls picked is blue. (5 marks)