



# MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SPECIAL /SUPPLEMENTARY EXAMINATION FOR  
BACHELOR OF ARTS

APP 102: QUANTITATIVE TECHNIQUES FOR POLICY MAKERS

DATE: 25/3/2021

TIME: 2.00-4.00 PM

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## INSTRUCTIONS TO CANDIDATES

Answer Question **ONE** which is compulsory and any other **TWO** Questions

### QUESTION ONE 30 MARKS (COMPULSORY)

- a) Solve  $\frac{5x}{6} - \frac{2x-1}{3} = \frac{4}{5}$  (5 marks)
- b) Find a number such that 3 more than one half of the number is two thirds the number (5 marks)
- c) Solve for x in  $x^2 - 9x + 4 = 0$  (4 marks)
- d) Compute the value of the following limit  $\lim_{x \rightarrow 2} (3x^2 + 5x - 9)$  (5 marks)
- e) Use the definition of derivatives to differentiate  $f(x) = x^2$  (5 marks)
- f) Find  $a_6$  for an arithmetic sequence where  $a_1 = 3x - 1$  and  $d = 2x + 6$  (6 marks)

### QUESTION TWO (20 MARKS)

- a) Find the equation for the line that has a slope of  $\frac{2}{3}$  and passes through (6,2) (4 marks)
- b) Evaluate the indefinite integral defined by  $\int (2x^2 + 4x + 3) dx$  (4 marks)
- c) The fourth term of a geometric progression is 27 and the seventh term is 729. Find
- The first term (4 marks)
  - The common difference (4 marks)
- d) Evaluate  $\frac{\log 125 - \log 25}{\log 25 + \log 5}$  (4 marks)

**QUESTION THREE (20 MARKS)**

- a) A rectangular field has an area of  $75 \text{ m}^2$ . The width of the field is 3 m longer than the length of the rectangle. What are the dimensions of the field? (8 marks)
- b) Differentiate  $f(t) = \frac{3t+9}{2-t}$  with respect to t (6 marks)
- c) Determine the points where the function below is not continuous  
$$h(t) = \frac{4t+10}{t^2-2t-15}$$
 (6 marks)

**QUESTION FOUR (20 MARKS)**

- a) The first term of an arithmetic sequence is equal to 6 and the common difference is equal to 3.
- Find the formula of the  $n^{\text{th}}$  term (3 marks)
  - Find the  $50^{\text{th}}$  term (3 marks)
- b) Given that the fourth and the eight terms of the arithmetic sequence are  $a_4=93$  and  $a_8=65$
- Find the common differences  $d$  and the first term  $a$  (4 marks)
  - Find the  $n^{\text{th}}$  term (2 marks)
- c) Find  $S_{10}$  for 250, 100, 40, 16,..... (4 marks)
- d) Find the  $9^{\text{th}}$  term of the sequence  
1,  $\sqrt{2}$ , 2, ..... (4 marks)

**QUESTION FIVE (20 MARKS)**

- a) Use simplex method to maximize  $z = 3x_1 + 2x_2$  subject to the following;
- $$-x_1 + 2x_2 \leq 4$$
- $$3x_1 + 2x_2 \leq 14$$
- $$x_1 - x_2 \leq 3$$
- $$x_1, x_2 \geq 0$$
- (14 marks)
- b) Evaluate the indefinite integral defined by  $\int (x^4 + 3x + 1)dx$  (6 marks)