

MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS STATISTICS AND ACTUARIAL SCIENCE

FIRST YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING DIPLOMA IN BUILDING AND CIVIL ENGINEERING DIPLOMA IN MECHANICAL ENGINEERING ECU 00101: ENGINEERING MATHS II

DATE: 2/5/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a)	Solve the equations	i) $\frac{4}{x-2} = \frac{5}{3x+4}$	(3 marks)
		ii) $2x^2 + x = 3$	(3 marks)
b)	Factorise		

Factorise

 $3x^2 + 10x + 3$

Hence solve the equation $3x^2 + 10x + 3 = 0$ (5 marks)

c) Solve for x in the equation

$$3(1-x) - 5(2-3x) = 2(x-4)$$
 (5 marks

d) Find the values of x and y that satisfy the simultaneous equations

$$2x + 3y = 7$$

$$3x + 2y = 8$$
(5 marks)

e)

$$p = \frac{m^2}{m^2 - 1} 2E\left(\frac{t}{d}\right)^3$$

express t in terms of the other quantities.

Examination Irregularity is punishable by expulsion

(5 marks)

f) Simplify the expression

$$\frac{1}{x+5} = \frac{x-6}{2x^2+9x-5}$$
 (4 marks)

QUESTION TWO (20 MARKS)

Use elimination method to solve the equations

$$5x - 3y - 2z = 31$$

$$2x + 6y + 3z = 4$$

$$4x + 2y - z = 30$$
(8 marks)

b) From the formula $I = \frac{E}{\sqrt{R^2} + W^2 L^2}$ Obtain an expression for R

(5 marks)

c) i) Solve

a)

$$3x - 2y = 0$$

$$4x + y = -11$$
(4 marks)

ii) Expand
$$(2x - 3y)(x + 5y)$$
 (3 marks)

QUESTION THREE (20 MARKS)

In terms of the other quantities

- i) by factorization $3x^2 11x 4 = 0$ (5 marks)
- ii) by completing of squares method

$$2x^2 + 5x - 4 = 0 (5 marks)$$

iii) by formula method

$$4x^2 + 7x + 2 = 0 (5 marks)$$

b) If f = crushing of the material l = length of the strut r = radius of gyration of the crosssectional area of the strut p=bucking strength c = a constant depending upon the materialand the nature of the ends of the strut then the Rankine-Gordon formula for the bucklingload is given by

$$p = \frac{f}{1 + c\left(\frac{l^2}{r^2}\right)}$$

Find r when f = 28 l = 15 p = 15.7 $c = \frac{1}{1500}$ (5 marks)

QUESTION FOUR (20 MARKS)

a) Given that y = mx + c find the value of m and c if

$$x = 3$$
 when $y = 2\frac{1}{2}$ and also $x = 5\frac{1}{2}$ when $y = 3\frac{3}{4}$ (5 marks)

b) Solve the simultaneous equation

$$2x + 3y + 4z = 29$$

$$3x - 4y + 5z = 14$$
 (8 marks)

$$5x + 5y - 6z = 1$$

c) Derive the quadratic formula hence solve

$$2x^2 - 7x + 4 = 0 (7 marks)$$

QUESTION FIVE (20 MARKS)

- a) The equation $ax^2 + bx + c = 0$ has roots $x = \frac{2}{3}$ and $x = \frac{-3}{2}$ find the values of *a*, *b* and *c* (6 marks)
- b) Solve the simultaneous equations

$$3x + 2y = 12$$

$$4x - 3y = -1$$
(6 marks)

c) Use the method of substitution to solve the equations

$$x + y + z = 9$$

 $2x + y + z = 7$ (8 marks)
 $2x + 2z = 5$