



## Murang'a University College

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)

University Examination 2014/2015

School of Engineering and Technology

Supplementary Examination for Diploma in Electrical Engineering

SEE 1207: ENGINEERING MATHEMATICS IV

Date: August 2015

2 Hours

Instructions: Attempt Question **One** and any other **Two** Questions.

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### Question One (30 Marks)

a) Find the general solution to the differential equation  $\frac{dy}{dx} = 1 + 2y$  (5 Marks)

b) Find the particular solution to the differential equation  $xydy - (x^2 + y^2)dx = 0$  given that  $y = 4$  when  $x = 1$  (6 Marks)

c) Given the data in the table below

$x$	1	4	9	14	23
$f(x)$	12	18	7	-22	-73

Use linear interpolation to find

i)  $f(3)$

ii)  $f(17)$  (5 Marks)

d) Find the particular solution to the differential equation  $(2x\cos(y) + 2y)dx + (2x - x^2\sin(y))dy = 0$  given that  $y = 0$  when  $x = 2$  (6 Marks)

e) Find the general solution to the differential equation  $x\frac{dy}{dx} + 3y = \frac{\cos(2x)}{x^2}$  (4 Marks)

f) Find the general solution to the differential equation  $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 4y = 0$  (4 Marks)

### Question Two (20 Marks)

a) Use Newton-Raphson method to find the root of the equation  $2x^3 - 5x - 12 = 0$  which is near  $x = 2.5$  correct to four decimal places (11 Marks)

- b) Given the data in the table below, use Newton-Gregory forward difference interpolating polynomial to find the value of  $f(4)$

$x$	-3	-1	1	3	5
$f(x)$	-51	-9	-15	27	213

(9 Marks)

**Question Three (20 Marks)**

- a) Find the general solution to the differential equation  $(xy - 2y)dx + xy^2dy = 0$  (5 Marks)

- b) Use the method of undetermined coefficients to find the general solution to the differential equation

$$3\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + y = 5\cos(x) \quad (15 \text{ Marks})$$

**Question Four (20 Marks)**

A resistor of resistance of  $100\Omega$  and a coil of inductance of  $0.5 \text{ H}$  are connected in series with a battery of  $20 \text{ volts}$ . Assuming that  $i = 0$  when  $t = 0$ . Find the current flowing in the circuit at any later time  $t$  seconds (20 Marks)

**Question Five (20 Marks)**

- a) Find the solution to the differential equation  $\frac{dy}{dx} = \sec x + y \tan x$  given that  $y = 1$  when  $x = 0$  (8 Marks)

- b) Find the particular solution to the differential equation  $x\frac{dy}{dx} = y - x$  given that  $y = 2$  when  $x = 1$  (12 Marks)