



# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)  
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND  
ELECTRONICS ENGINEERING

EED 313: CONTROL SYSTEMS III

DATE: 3/8/2016

TIME: 8:30 – 10:30 AM

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## INSTRUCTIONS

Answer Question One And Any Other Two Questions

### QUESTION ONE (COMPULSORY) (30 MARKS)

- i) State the three linear elements that are used in system simulation in analogue computation (6 marks)
- ii) Give any two reasons why differentiators are avoided in analogue computation. (4 marks)
- iii) With an aid of a diagram, derive the expression of the out put voltage of a three input summing amplifier. (7 marks)
- iv) Give three factors which determine the accuracy of an analogue computer. (3 marks)
- v) Obtain an analogue computer diagram to solve the differential equation below (10 marks)  
$$Y'' + 5y' + 4y = 3$$

## QUESTION TWO

Obtain an analogue computer floww diagram to solve the following second order simultaneous defferential equitions.

$$Y''-4y-x=0$$

$$X''+3x+2x=5 \quad (20 \text{ marks})$$

## QUESTION THREE

Given the following differential equitions

$$X''+3y''+4x'+14x=2$$

$$Y''+5x''+3y'+7x'+12y=0 \quad (20 \text{ marks})$$

## QUESTION FOUR

Design a phase lead network system whose transfer function is given by

$$G(s) = 20$$

$$S(1+0.2s)^2 \text{ for phase margine of at least } 45^0$$

Compensating details are

$\dot{\omega}(\text{rad/sec})$	1	2	3	4	5	10	20
angle	-112	-136	-152	-167	-180	-217	-242

(20 marks)

## QUESTION FIVE

A 10  $\mu\text{f}$  capacitor charged to 500coulombs is discharged through a 1m $\Omega$  resistor. Obtain an analogue computer diagram to give the variation of current through the resistor. (20 marks)