MURANG'A UNIVERSITY COLLEGE

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

DEPARTMENT: ELECTRICAL ENGINEERING

LEVEL:	**DIPLOMA**
CLASS:	**MRUC/EE/P/14DJ**
TERM/SEMESTER:	**I1 YEAR 11**
ACADEMIC YEAR:	**2014/2015**
UNIT:	**MEASUREMENT AND FAULT DIAGNOSIS**
UNIT CODE:	**SEE1212**

DATE: 17TH APRIL 2015   **TIME: 2 HOURS**

Instructions to candidates

This paper contains two sections A and B

Answer question one (COMPULSORY) and any other two question in section B.

You should have the following for this examination;

- Drawing instruments
- Scientific calculator

SECTON A (COMPULSORY)

Qn. 1(a) State the three fundamental quantities which mechanical quantities can be expressed in

(3marks)

(b) Derive the dimensions of the following mechanical quantities

    (i) Velocity **(3marks)**

    (ii) Acceleration **(3marks**)

    (iii) Force **(3marks)**

(c) The dimensional formula for potential difference is $(U^{1/2}M^{1/2}L^{3/2}T^{-2})$. Show how the formula is derived

(6marks)

(d) The expression of eddy current loss P per meter length of a wire may be written as

$$P \propto f^a B_m^{\ b} d^c \rho^g$$

Where f-frequency $\qquad\qquad\qquad\qquad\qquad\qquad$ B_m-maximum flux density

$\qquad$ d-diameter of the wire $\qquad\qquad\qquad\qquad$ ρ-resistivity of wire mate

and a; b; c and g are constants, determine the values of a; b; c and g from the dimensions of quantities involved. Length (L), Mass (M), Time (T) and current (I) may be taken as fundamental quantities. Derive the dimensions of each quantity from fundamentals.

N.B. Do not reproduce the dimension from the memory $\qquad\qquad\qquad\qquad$ **(12mrks)**

SECTION B (Answer any two questions)

Qn. 2.(a) $\qquad$ With the aid of a diagram explain the working multi-range ammeter
$\qquad$ **(10mrks)**

$\qquad$ **(b)** $\qquad$ Design a multi-range d.c milli-ammeter using a basic movement with an internal resistance Rm =60 Ω and a full scale deflection current of Im=1mA. The range required is 0-10Ma, 0-50mA, 0-100mA, and 0-500mA. $\qquad\qquad$ **(10mrks)**

Qn. 3. (a) $\qquad$ With the aid of a circuit diagram derive the general equation of an A.C. Bridge

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **(10mrks)**

$\qquad$ **(b)** $\qquad$ A bridge consist of the following

$\qquad\qquad\qquad$ Arm ab-a choke coil having a resistance R_1 and inductance L_1

$\qquad\qquad\qquad$ Arm bc-a non-inductive resistance R_3

$\qquad\qquad\qquad$ Arm cd-a mica condenser C_4 in series with non-inductive resistance R_4

$\qquad\qquad\qquad$ Arm da-a non-inductive resistance R_2

$\qquad$ When this bridge is fed from a source of 800HZ balance is obtained under following conditions

$\qquad$ R_2=2520Ω, R_3=760Ω, C_4=0.45µF, R_4=65.4Ω. The series resistance of capacitor is=0.5Ω. Calculate the resistance and inductance of the choke coil. The supply is connected between **a** and **c** and the detector is between b and d $\qquad\qquad\qquad\qquad\qquad\qquad$ (10mrks)

Qn.4. With the aid of a diagram describe the working of a cathode ray oscilloscope

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **(20mrks)**