THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

EEC 2208: MEASUREMENT & FAULT DIAGNOSIS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2011

TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer booklet*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are clearly shown.
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

a) Explain the following terms as used in measurements
    i.   Primary fundamental units
    ii.   Auxiliary fundamental units
    iii.   Derived units   (6 marks)

b) (i) Derive the dimensional equation of force in terms of fundamental units

   (ii) Express coulombs law of the force exerted between two charges Q_1 and Q_2 distance d
       apart and hence derive the dimensional equations of charge   (8 marks)

c) With the aid of a diagram, explain how magnetic flux density is measured by hall effect
   method   (6 marks)

SECTION B (Answer *any TWO questions from this section - 20 marks each*)

Question 2

a) (i) State FIVE sources of instrument errors
   (ii) Explain the classification of indicating instruments   (8 marks)

b) Define the following:
    i.   Precision
    ii.   Accuracy

c) (i) Explain the following in instruments

     I.   Shunt
    II.   Multiplier

   (ii) Determine the ammeter modification to provide the range 0 -5A, for a basic meter
       movement with an internal resistance of 730 Ω and full scale deflection current 5mA
                                                (8 marks)

Question 3

a) Explain the following errors and the methods of minimizing them
    i.   Gross errors
    ii.   Systematic errors
    iii.   Random errors   (10 marks)

b) Explain the half split method of fault diagnosis   (4 marks)

c) Explain the phases of corrective maintenance   (6 marks)

Question 4

a) With the aid of a diagram, explain the measurement of resistance by the substitution method and explain why the accuracy of the meter does not affect the result (8 marks)

b) (i) List **THREE** detectors used for a.c. bridges

$$R_2 = R_3 = 100\Omega$$

(ii) Figure 1 shows the arms of an ac Maxwell's bridge at balance. Determine the resistance and inductance of the coil

(12 marks)

Question 5

a) Explain the following failures
   i.   Catastrophic
   ii. Degradation
   iii. Inherent weakness (6 marks)

b) Explain the following

   i.   MTBF
   ii. Reliability
   iii. Maintainability
   iv. Availability (8 marks)

c) An electronic equipment has MTBF of 500 hours. Determine the probability of failure for this equipment in 1000 hours of file (6 marks)