ROLL NO. _____

Code: AE60 Subject: INSTRUMENTATION AND MEASUR E

AMIETE – ET

Time: 3 Hours **DECEMBER 2013** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Not taking care of zero adjustment of an instrument before measurement can be classified as

(A) systematic error **(B)** gross error
(C) random error **(D)** dynamic error

b. A galvanometer recorder has

(A) very high input impedance **(B)** high input impedance
(C) low input impedance **(D)** very low input impedance

c. A Dual beam CRO uses

(A) electronic switch **(B)** two electron guns
(C) one electron gun **(D)** two time base generator circuits

d. The sensitivity of a Wheatstone bridge depends upon _____.

(A) galvanometer current sensitivity **(B)** galvanometer resistance
(C) bridge supply voltage **(D)** All of these

e. The value of the multiplier resistance on the 500V range of d.c. voltmeter, that uses 50 μA meter movement with an internal resistance of 200ohms is

(A) 99.99 MΩ **(B)** 0.999 MΩ
(C) 9.99 MΩ **(D)** 999 MΩ

f. The chart speed of a recording instrument is 30mm/s. One cycle of the signal being recorded extends over 5mm(time base)then the frequency consumes is

(A) 30 cycles **(B)** 6 cycles
(C) 0.3cycles **(D)** 5 cycles

g. A Null type of instrument as compared to a deflection type instrument has

(A) high accuracy **(B)** low sensitivity
(C) fast response **(D)** all of these

h. A voltmeter having a resistance of 998 ohms is connected to a cell of emf 2 volt and internal resistance 2 ohm. The error in the measurement of emf will be

(A) 4×10^{-1} V **(B)** 2×10^{-1} V
(C) 4×10^{-3} V **(D)** 2×10^{-3} V

i. Maxwell's bridge is used to measure Q factor in the range of

(A) 1-100 **(B)** 1-10
(C) 1-50 **(D)** 2-200

j. For a quarter wavelength ideal transmission line of characteristics impedance 50 ohm and load impedance 100 ohm, the input impedance is

(A) 25Ω **(B)** 52Ω
(C) 250Ω **(D)** 2.5Ω

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Differentiate between the direct and indirect method of measurement. **(8)**

b. Define limiting errors. A 0-10A ammeter has an accuracy of 1.5% of full scale reading. The current indicated by the ammeter is 2.5 A. Calculate the limiting values of current and percentage limiting error. **(8)**

Q.3 a. A Kelvin's bridge is shown in Fig.1 below, the ratio of R_a to R_b is 1200 ohms R_1=10 ohms and R_1=0.5R_2. Calculate unknown resistance R_x. **(8)**

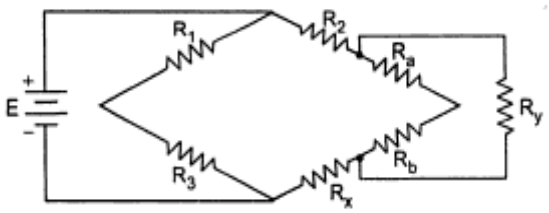

Fig.1

b. An ac bridge has the following constants in Fig.2.
Arm AB – capacitor of 0.5 μF in parallel with 1kΩ resistance
Arm AD – resistance of 2kΩ
Arm BC – capacitor of 0.5 μF
Arm CD – unknown capacitor C_x and R_x in series
Frequency – 1 kHz
Determine the unknown capacitance and dissipation factor. **(8)**

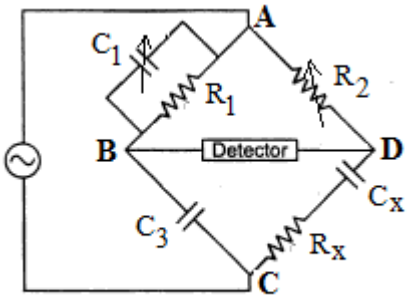

Fig.2

Q.4 a. Convert a basic D'Arsonval movement with an internal resistance of 100 ohm and full scale deflection of 10mA into a multirange dc voltmeter with ranges from 0-5V,0-50V,0-100V. **(8)**

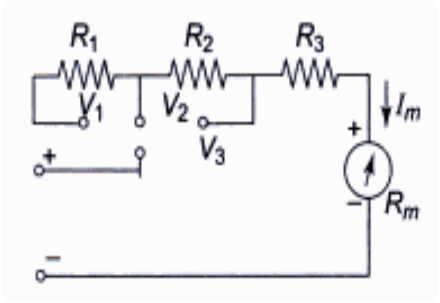

Fig.3

b. Explain with the diagram solid state voltmeter using Op-Amp. **(8)**

Q.5 a. Explain with the help of a neat diagram the working of a Universal Counter for measurement of frequency and time period. **(8)**

b. Draw the labelled circuit diagram and explain working of a Q-meter. Write its applications. **(8)**

Q.6 a. Describe with the help of a neat block diagram the operation of an AF Sine wave generator. **(8)**

b. Explain any four features of CRT. **(8)**

Q.7 a. Explain the working of Heterodyne Wave Analyzer. Write its applications. **(8)**

b. Explain with the block diagram, the working of a harmonic distortion analyzer. **(8)**

Q.8 a. Write the importance of Recording Data. Explain the working and application of X-Y recorder. **(8)**

b. Discuss the advantages and limitation of digital data recording. **(8)**

Q.9 a. Explain working of LVDT. Where it is used and what are its advantages. **(8)**

b. (i) Calculate the strain in a specimen if the attached strain gauge gas a strain factor of 2, a resistance of 120ohms and the change in resistance measured is 0.1ohms. **(4)**

(ii) Calculate the gauge factor of a strain gauge made from a material that acts like a perfectly incompressible material deforming elastically at small strain. (Assuming the resistivity doesn't change with strain) **(4)**