ROLL NO. _____

Code: AE60 Subject: INSTRUMENTATION AND MEASUR S

AMIETE – ET

Time: 3 Hours **JUNE 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. A megger is used for measurement of

(A) low valued resistance
(B) medium valued resistance
(C) high valued resistance
(D) all of these

b. A thermocouple consists of two different_____

(A) resistors **(B)** dielectrics
(C) conductors **(D)** batteries

c. Schering bridge is a bridge circuit used for measuring unknown_____

(A) capacitance **(B)** resistance
(C) inductance **(D)** current

d. Hall effect is used for_____

(A) DC ammeters **(B)** AC/DC ammeters
(C) AC ammeters **(D)** RMS meters

e. Resolution of a digital meter is given by _____ where n is the number of bits of ADC

(A) $1/2^n$ **(B)** 2^n
(C) n **(D)** 2n

f. Field strength meter measures_____

(A) Power of RF signal **(B)** Electrical voltage per meter
(C) Joules **(D)** Amperes

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g. An oscilloscope has upper limiting frequency is given by

(A) $f_r = V_{ax}/4l$ **(B)** $f_r = V_{ax}/l$

(C) $f_r = V_{ax} \times 4l$ **(D)** $f_r = V_{ax}^2/4l$

h. Bolometer is used for measurement of

(A) RF frequency **(B)** Microwave Power
(C) Energy **(D)** Temperature

i. Strip chart recorder is used for

(A) Plotting light meter **(B)** ECG
(C) MRI **(D)** Antenna plots

j. Strain gauge measures_____

(A) pressure **(B)** voltage
(C) fuel level **(D)** biometric data

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

Q.2 a. Define the following with respect to the measuring system:
(i) True value (ii) Static correction
(iii) Relative error (iv) Reproducibility **(8)**

b. A voltmeter has a range of 0-5 V. The true value of the measured voltage is 3 V, while the read value is 2.95 V. What is the absolute error and relative error? **(4)**

c. What is dynamic response? Explain the various types of dynamic response. How are they differ from dynamic characteristics? **(4)**

Q.3 a. Derive an expression for the sensitivity of a Wheatstone bridge. **(8)**

b. What are the advantages and disadvantages of an Anderson's bridge? In an Anderson's bridge the different arms have components as shown in Fig.1. Calculate the value of unknown inductance. Where $R_3 = 600\Omega$, $r = 400\Omega$, $R4 = 600\Omega$, $R_2 = 600\Omega$, $C = 0.5\mu F$ **(8)**

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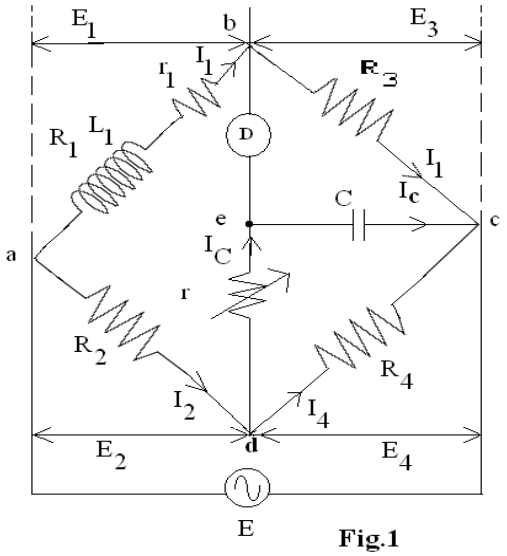

Fig.1

Q.4 a. Draw the scheme of a Multi-range ammeter. Design a multi-range DC ammeter with an internal resistance $10\,\Omega$. The full scale deflection current is 10 mA and it is required to measure 0 to 50 mA, 0 to 100 mA and 0 to 250 mA **(8)**

b. Explain the working of a True RMS voltmeter. **(8)**

Q.5 a. Draw a schematic of a Dual Slope DVM and explain its principle. **(8)**

b. What is the importance of Q in a RLC circuit? Explain the principle of Q measurement. Calculate the shunt resistance required in a LC circuit given inductance of 10 mH and capacitance 200 pF. The internal resistance of inductance is 12 Ω. The required Q of the circuit is 10 at a frequency of 100 kHz. **(8)**

Q.6 a. Explain basic elements of a function generator. What is the importance of:
(i) Duty cycle (ii) Rise time **(8)**

b. Define sensitivity and deflection factor of a Cathode Ray Tube (CRT). What are the role of the following in CROs:
(i) Time base generator circuit (ii) X-channel
(iii) Triggered Sweep (iv) Astigmatism **(8)**

Q.7 a. What is the difference between wave analyzer and spectrum analyzer? Explain and discuss the principle of a spectrum analyzer. **(8)**

b. What is the purpose of heterodyning in a high frequency measurement? **(8)**

Q.8 a. Bring out the difference between CRO and recorders. Draw the schematic of a simple X-Y recorder. **(8)**

b. What is the principle of working of magnetic recorders? Explain the record process. (

Q.9 a. What do you mean by transfer characteristic? Draw and explain transfer characteristic of atleast three transducers. **(4)**

b. Discuss the various metals used for temperature sensing and converting to electrical signal. **(6)**

c. Find the temperature coefficient, if the variation in resistance at different temperature of a thermistor is tabulated as shown below:

Temp(ºC)	80	85	90	95	100	105	110	115	120	125	130
Resistance(Ω)	550	558	562	568	573	578	584	589	594	600	615

(6)