ROLL NO. _____

Code: AE60/AE111 Subject: INSTRUMENTATION AND MEASUREMENTS

AMIETE – ET (Current & New Scheme)

Time: 3 Hours **JUNE 2015** **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. Purely mechanical instruments cannot be used for dynamic measurements because they have

(A) High Inertia **(B)** Low time constant
(C) Low response time **(D)** All of these

b. A thermometer is calibrated 150°C to 200°C. The Accuracy is specified within ±0.25% of instrument span. The maximum static error is

(A) + 0.25% **(B)** – 0.25%
(C) ± 0.125% **(D)** ± 0.25%

c. Laplace transform of unit step input is

(A) $1/s^2$ **(B)** 1
(C) $1/s^3$ **(D)** $\frac{1}{s}$

d. Which of the following method is most suitable to measure 1 ohm resistance?

(A) Wheatstone bridge **(B)** Meggar
(C) Ohmmeter method **(D)** Voltmeter – Ammeter method

e. Maxwell's inductance-capacitance bridge is used for measurement of inductance of

(A) Low Q Coils **(B)** Medium Q Coils
(C) High Q Coils **(D)** All of these

f. Large current in RF range at low moderate frequencies is measured by

(A) Simple ammeter **(B)** ammeter using thermocouple
(C) Using a CT **(D)** Using Aryton shunt

g. Measurement by dual slope DVM is performed during

(A) Rising slope **(B)** Falling slope
(C) Rising & falling slope **(D)** None of these

h. Trigger pulses in the CRO are used

(A) To generate high voltage required for the CRT
(B) To synchronise the input with the time base generator
(C) To synchronise the input and the vertical amplifier
(D) To generate low voltage required for the CRT

i. A X-Y recorder uses the principle of

(A) Galvanometer **(B)** Mechanical levers
(C) Electrostatic **(D)** Self-balancing potentiometer

j. A Wheatstone bridge cannot be used for precision measurements because errors are introduced in to it, on account of

(A) resistance of connecting leads **(B)** thermo-electric emfs
(C) contact resistance **(D)** all of these

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

Q.2 a. Define the following: **(8)**
(i) Accuracy
(ii) Linearity
(iii) Dead zone
(iv) Hysteresis

b. Explain the following errors giving suitable example & write methods to minimize these **(8)**
(i) Gross errors
(ii) Random errors **(8)**

Q.3 a. Calculate current passing through unbalanced Wheatstone bridge's galvanometer

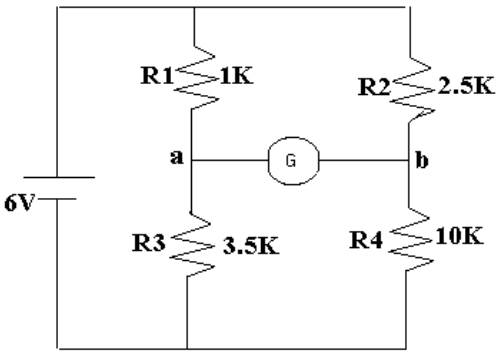

Fig. 1

Resistance of galvanometer Rg = 300Ω **(8)**

b. A sample of insulation was placed in arm AB of a schering bridge, when the bridge, was balanced at a frequency of 50Hz the other arms of bridge were **(8)**
Arm BC → A non inductor R of 100Ω
Arm CD → A non inductive R of 300Ω in parallel with a capacitor of 0.5μF
Arm DA → A loss free capacitor of 100 pf
Determine the capacitance, equivalent series resistance and power factor of the insulation in test arm AB.

Q.4 a. Design a multirange ammeter with range of 0-1A, 5A & 10A employing individual shunt in each. A D'Arsonal movement with an internal resistance of 500Ω and a full scale deflection of 10 mA is available. **(8)**

b. Calculate the value of the multiplier resistance for a 50 V rms ac range on the voltmeter as shown in Fig.2 **(8)**

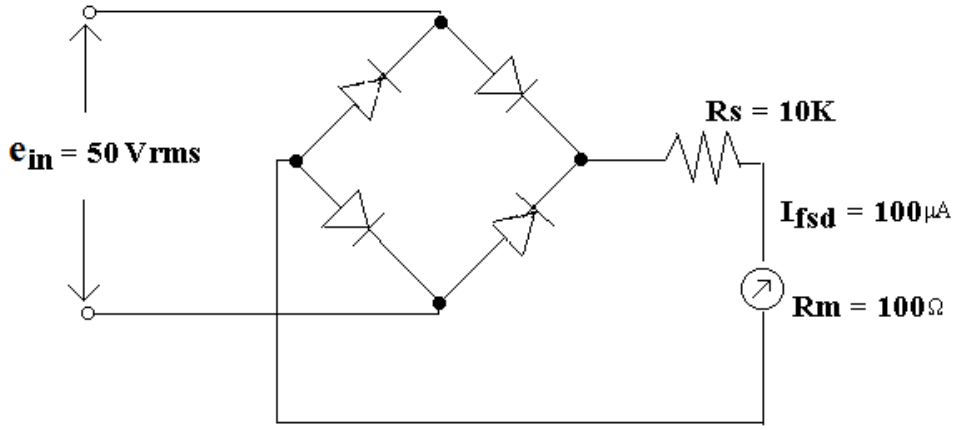

Fig.2

Q.5 a. Draw block diagram of integrating type DVM and explain its working. **(8)**

b. Draw block diagram of digital capacitance meter & explain its working. **(8)**

Q.6 a. Using circuit diagram & output wave form explain working of triggered sweep in CRO. **(8)**

b. Draw block diagram of function generator and explain its working. **(8)**

Q.7 Explain the following with the help of block diagram.
(i) Spectrum Analyzer
(ii) Self balancing bolometer bridge **(8+8)**

Q.8 Discuss the working of the following using block diagrams.
(i) Potentiometric recorders
(ii) Magnetic recorders **(8+8)**

Q.9 Write short notes on the following: **(4×4)**
(i) Selection of transducers (ii) Thermistors
(iii) Flow measurement (iv) Objectives of a DAS