ROLL NO. _____

Code: AE60/AE111 Subject: INSTRUMENTATION AND MEASUREMENTS

AMIETE – ET (Current & New Scheme)

Time: 3 Hours **December 2016** **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 the above

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

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

g. A 600v voltmeter is specified to accuracy within ±2% at full scale. The limiting error of the instrument to measure 250V is
(A) 4.8% **(B)** 3.8%
(C) 8.4% **(D)** 8.3%

h. A voltmeter having a resistance 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. The sensitivity of a 500μA meter movement which is to be used as a dc voltmeter is

(A) 2KΩ/V **(B)** 20KΩ/V
(C) 0.2KΩ/V **(D)** 2Ω/V

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

Q.2 a. Distinguish between direct and indirect methods of measurement. Give examples to support your answer. **(8)**

b. A voltmeter having a sensitivity of 1.5K Ω/ V reads 80V on its 150 V scale when connected across an unknown resistor in series with a milli-ammeter. When mili-meter reads 15mA, **(8)**
Calculate (i) apparent resistance of the unknown resistor
(ii) Actual resistance of the unknown resistor and
(iii) Error due to the loading effect of voltmeter

Q.3 a. A Kelvin's bridge is shown in fig. 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)**

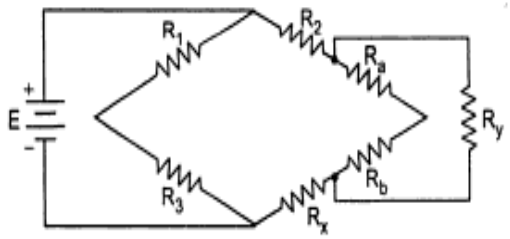

Fig.1

b. How Schering Bridge is used for the measurement of unknown capacitance? Derive its balance equation. **(8)**

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

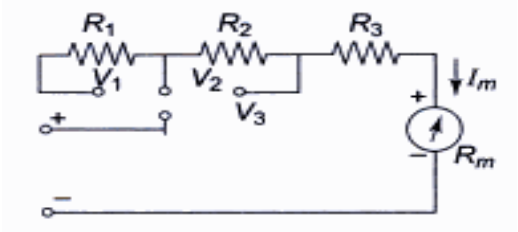

Fig.2

b. Calculate the value of the multiplier resistor for a 10V rms ac range on the voltmeter shown in fig. below: **(8)**

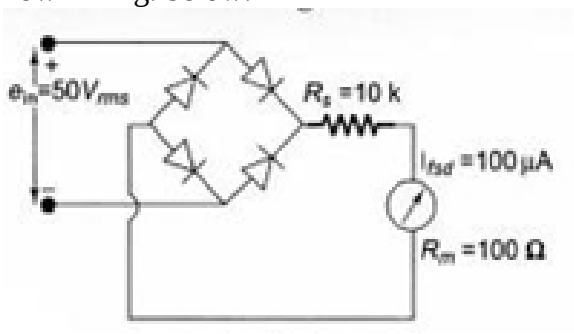

Fig.3

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. Describe the circuit and working of a Q-meter. Describe 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. What are the advantages of dual trace over dual beam CRO for multiple trace? **(8)**

Q.7 a. What are the applications of wave analyzer? **(8)**

b. What is the dynamic range of a spectrum analyzer with a bandwidth of 30KHz, a noise figure of 15dB and a third order intercept of +25 dBm? **(8)**

Q.8 a. Explain the working of X-Y recorder. Give its applications. **(8)**

b. Discuss in detail the objectives and requirements of recording data. **(8)**

Q.9 a. What are the objectives of data acquisition system? **(8)**

b. (i) Calculate the strain in a specimen if the attached strain gauge has 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 deforming elastically at strain. (assuming the resistivity doesn't change with strain)? **(4)**