ROLL NO. _____

Code: AE60 Subject: INSTRUMENTATION AND MEASUREMENTS

AMIETE – ET (NEW SCHEME)

Time: 3 Hours **JUNE 2012** **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 measure of the repeatability of a measurement of some quantity is _____

(A) Accuracy **(B)** Error
(C) Reproducibilty **(D)** Precision

b. An integrator contains 100KΩ and 1μF capacitor. If the voltage applied to the integrator input is 1V, then the output voltage of integrator after 1 second is _____

(A) 10V **(B)** 1V
(C) 5 V **(D)** 15 V

c. A digital voltmeter has a read-out range from 0-9,999 counts. The resolution of the instrument for full scale reading is 9.999V is _____

(A) 11 mV **(B)** 11 V
(C) 1mV **(D)** 1 V

d. Device similar to an RTD but has a negative temperature coefficient is _____

(A) Strain Gauge **(B)** Thermistor
(C) Thermocouple **(D)** Negative-type RTD

e. The value of the multiplier resistance on the 50V dc voltmeter that uses a 500μA meter movement with an internal resistance of 1KΩ is _____

(A) 2kΩ **(B)** 20KΩ
(C) 99Ω **(D)** 99KΩ

f. Capacitance can be measured by _____

(A) Maxwell's bridge **(B)** Schering bridge
(C) Kelvin bridge **(D)** Wien's bridge

g. An aquadag is used in a CRO to collect _____

(A) primary electrons
(B) secondary emission electrons
(C) both primary and secondary emission electrons
(D) none of the above

h. X-Y recorders records _____

(A) one variable with respect to another variable
(B) one variable on X-axis with respect to time on Y-axis
(C) one variable on Y- axis with respect to time on X–axis.
(D) none of the above

i. The inductance of the coil using Q- meter can be calculated by the expression _____

(A) $\frac{1}{2\pi f\ C}$ henry **(B)** $\frac{1}{(2\pi f)^2 C}$ henry

(C) $2\pi f\ C$ henry **(D)** $(2\pi f)^2 C$ henry

j. A bolometer is used for the measurement of _____.

(A) transmission loss **(B)** high voltages
(C) micro-wave power **(D)** VSWR

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 1000Ω/ V reads 100V on its 150 V scale when connected across an unknown resistor in series with a milli-ammeter. When the milli-ammeter reads 5mA, 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. **(8)**

Q.3 a. For the Wheastone bridge is shown in Fig.1,the values of resistances are R_1=1K Ω, R_3= 1K Ω, R_4= 5K Ω, R_G=100 Ω and the Thevnin source generator voltage E_0= 24mV. If the galvanometer current is 13.6μA, calculate the value of Q. **(6)**

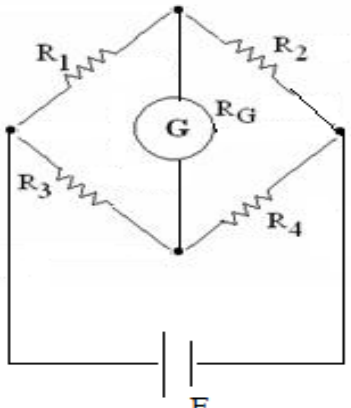

Fig.1

b. Derive the balance equations for an Anderson's bridge. Draw the phasor diagram for the conditions under balance. Discuss the advantages and disadvantages of the bridge. **(10)**

Q.4 a. Explain with the help of a diagram the working of simple multimeter. **(8)**

b. Calculate the multiplier resistor required for a 100Vrms range on the voltmeter shown in Fig.2 **(4)**

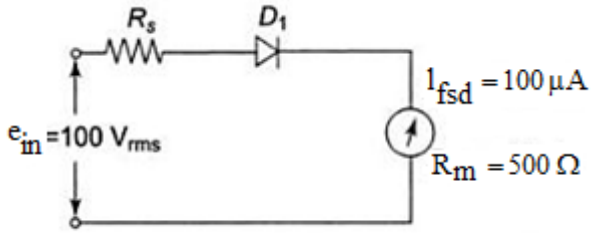

Fig.2

c. Why is thermocouple used in RF measurement of current? **(4)**

Q.5 a. Explain the merits and limitations of DVM over analog voltmeter. **(8)**

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

Q.6 a. Draw the block diagram of a Pulse Generator and explain the function of each block. **(8)**

b. Explain the following with reference to a CRO
(i) Vertical Amplifier.
(ii) Horizontal Deflection System. **(8)**

Q.7 a. Explain an arrangement for the measurement of Standing Wave Ratio. **(8)**

b. Write a short notes on
(i) spectrum analyzer. (ii) bolometer **(8)**

Q.8 a. What are the functions of galvanometer recorders? **(8)**

b. Explain the working of Digital Data Recording. Give its applications. **(8)**

Q.9 a. Explain D/A and A/D converters w.r.t signal conditioning of the inputs. **(8)**

b. A strain gauge having resistance of 100Ω and a gauge factor of 2 is connected in series with a ballast resistance of 100Ω across a 12V supply. Calculate
(i) the difference between the output voltage with no stress applied and a Stress of 140 MN/m^2. If the modulus of elasticity is $200GN/m^2$ then
(ii) find the expression for the change in output voltage when the strain gauge is connected in ballast. **(8)**