2024

ELECTRONICS — HONOURS

Paper : CC-11

(Electronic Instrumentation)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.*** **1** and ***any four*** questions from the rest.

1. Answer ***any ten*** questions : 1×10

(a) Which is the correct mathematical expression for relative error e_r?

(i) e_r = true value absolute error (ii) e_r = true value/measured value

(iii) e_r = absolute error/true value (iv) e_r = measured value/true value.

(b) A galvanometer can be converted into a DC voltmeter by adding

(i) small value resistance in series (ii) small value resistance in parallel

(iii) high value resistance in series (iv) high value resistance in parallel.

(c) With the increase in the intensity of light, the resistance of a photovoltaic cell

(i) increases (ii) decreases

(iii) remains same (iv) none of these.

(d) Aquadag is a part of

(i) Ohm meter (ii) Ammeter

(iii) Voltmeter (iv) CRO.

(e) LVDT is a

(i) variable resistance type transducer (ii) variable inductance type transducer

(iii) variable capacitance type transducer (iv) none of these.

(f) Which of the following is not an Analog to Digital converter?

(i) Successive approximation converter (ii) R-2R ladder

(iii) Counter type (iv) Dual slope converter.

(g) Precision means

(i) consistency or repeatability (ii) successive reading differ

(iii) both (i) and (ii) (iv) none of (i) and (ii).

(h) A galvanometer has a 10 ohm resistance and a full scale deflection of 5 mA. What is the resistance value that should be linked in series with it to allow it to read 2V?

(i) 20Ω (ii) 10Ω

(iii) 40Ω (iv) 30Ω.

(i) Piezoelectric transducer is used for measuring

(i) non-electrical quantities (ii) electrical quantities

(iii) chemical quantities (iv) any quantity.

(j) Best A/D conversion accuracy can be achieved by

(i) counting type converter (ii) successive-approximation

(iii) dual-slope converter (iv) none of these.

(k) When the balance condition is satisfied in an a.c. bridge the sum of the _____ of the opposite arms are equal.

(i) resistances (ii) impedances

(iii) reactances (iv) phase angles.

(l) Which transducer is different from others?

(i) Thermistor (ii) Thermocouple

(iii) RTD (iv) Solar cell.

2. (a) Draw the circuit diagram of an Anderson's bridge. Write the use of this bridge.

(b) How an unknown capacitance is measured by De Sauty bridge? (3+2)+5

3. (a) Discuss how a galvanometer movement can be converted into an ammeter?

(b) Calculate the shunt to be connected in parallel with a galvanometer if 10% of the main current should be allowed to pass through the galvanometer. Given, the resistance of the galvanometer is 99Ω.

(c) Why should an ammeter have a very small resistance? Define figure of merit of a galvanometer. 4+3+(1+2)

4. (a) Write the balance conditions for an a.c. bridge.

(b) How an unknown capacitance is measured by De Sauty's bridge? Explain.

(c) Draw the circuit diagram of Maxwell's bridge. Discuss the limitations of Maxwell bridge. 2+4+(2+2)

5. (a) Draw the internal structure of CRT and briefly discuss on electron gun, deflecting system and fluorescent screen.

   (b) Differentiate between dual beam and dual trace CRO. (2+2+2+2)+2

6. (a) Draw the block diagram of an oscilloscope.

   (b) A lissajous figure is produced on the screen of a CRO when sinusoidal voltages are applied to both the vertical and horizontal deflecting plates. The figure makes 3 tangencies with the horizontal and 4 tangencies with the vertical. If the frequency of the horizontal signal is 2.0 kHz, what is the frequency of the vertical signal?

   (c) Why active probe is used in CRO input? What is the use of attenuators in a CRO probe? 3+3+(2+2)

7. (a) Discuss briefly how a R-2R ladder circuit can convert a digital voltage to an analog voltage.

   (b) Describe in brief how an analog voltage can be converted to digital form by successive-approximation type converter. 5+5

8. (a) What are active and passive transducer?

   (b) What is a Strain Gauge? What is Gauge-factor? Write the working principle of a Strain Gauge. 3+(2+2+3)
