

Code: AE12  
Time: 3 Hours

Subject: INSTRUMENTATION AND MEASUREMENT

Max. Marks: 100

**DECEMBER 2008**

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.
  - 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 best alternative in the following: (2x10)**

- a. The validity of a measurement is :
- (A) How well an instrument actually measures?
  - (B) Verifying the measurement.
  - (C) Nullifying the measurement.
  - (D) How well an instrument actually measures what is supposed to measure.
- b. The Wheatstone bridge may be used with:
- (A) A C excitation
  - (B) D C excitation
  - (C) A C & D C excitation
  - (D) No excitation
- c. The calibrator frequency in CRO is :
- (A) 1MHz
  - (B) 10 KHz
  - (C) 20 KHz
  - (D) 1 KHz
- d. Audio Signal Generator usually produce sine and square waves over the range of:
- (A) 20 Hz and 20 KHz
  - (B) 10 Hz and 50 KHz
  - (C) 1 KH and 30 KHz
  - (D) 1 MHz and 10 MHz
- e. The Function Generator generally produces:-
- (A) Sine and Square Waveform
  - (B) Square and Triangular Waveform.
  - (C) Sine, Square and Triangular Waveform.
  - (D) Sine and Rectangular Waveform.
- f. A Transducer is a device that converts:
- (A) A physical stimulus to an electrical voltage.
  - (B) Displacement to mechanical movement.
  - (C) Force into movement.

- (D) Temperature into physical stimulus.
- g. Low capacitance probes are used for:
- (A) General purpose measurements with CRO up to 10 MHz.
  - (B) Measuring low voltage.
  - (C) Measuring low capacitance.
  - (D) Measuring low currents.
- h. The effect of Electromagnetic interference can be minimised by:
- (A) Shielding
  - (B) Filtering
  - (C) Shielding & Filtering
  - (D) Shielding , Filtering and use of differential amplifiers.
- i. Voltage gain is the ratio of:
- (A) Output power to Input power.
  - (B) Output current to Input power.
  - (C) Input current to Output voltage.
  - (D) Output voltage to Input voltage.
- j. Selectivity is measured as the bandwidth between:
- (A) – 3dB points on the IF curve.
  - (B) – 6dB points on the IF curve.
  - (C) –10dB points on the IF curve.
  - (D) None of the above.

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

- Q.2** a. What is a Transducer? Briefly explain classification of Transducers. (8)
- b. What are the three general classes of errors? Briefly explain them. (8)
- Q.3** a. A voltmeter, having a sensitivity of  $100 \Omega/V$  reads 100V on its 150 V scale when connected across an unknown resistor in series with an ammeter. When the ammeter records 5 mA, calculate
- (i) The apparent resistance of the unknown resistor
  - (ii) The error due to loading effect of the voltmeter. (8)
- b. Define calibration? Briefly explain the process of calibration. (8)
- Q.4** a. What is Digital Multimeter? How Digital Multimeter is used for measurement of current? (8)

b. The four arms of Maxwell bridge network are as follow:

AB and BC are non reactive resistor of  $100 \Omega$  each, DA is standard variable inductor L of resistance  $32.7 \Omega$  and CD comprises a standard variable resistor R in series with a coil of unknown impedance. Balance is obtained when  $L = 47.8 \text{ mh}$  and  $R = 1.36 \Omega$ . Find the resistance and reactance of the coil. (8)

**Q.5** a. Briefly explain with the help of block schematic Frequency Synthesized Signal Generator. (8)

b. Describe a thermal method to measure RF Power. (8)

**Q.6** a. Draw internal structure of a Cathode Ray Tube. Briefly explain electrostatic focusing of a CRT. (8)

b. The X- Deflecting plates in a CRT are 20 mm long and 5 mm apart. The centre of plates is 0.25 m from the screen. The accelerating voltage is 3,000 V. Determine the deflection sensitivity and deflection factor of the CRT. (8)

**Q.7** a. What are the major measurement errors made by an Electronic Counter? Briefly explain each. (8)

b. A Solenoid is 60 cm long and 2.5 cm in diameter and is uniformly wound with 600 turns of insulated wire. Find magnetic field strength at the centre of the solenoid when carrying a current of 2 amperes. If the secondary coil is wound round the centre part of the solenoid, calculate the flux passing through it. (8)

**Q.8** a. Briefly explain receiver parameters. How sensitivity is measured? (8)

b. With the help of block schematic, explain FM receiver. Name important types of FM Detectors. (8)

**Q.9** a. What is Wave Analyzer? Draw its block schematic and explain major components. (8)

b. Explain the successive approximation type A/D converter. Give its advantages over the other types of converters. (8)