Code: AE12 **Subject: INSTRUMENTATION AND MEASUREME**
Time: 3 Hours **Max. Marks: 100**

JUNE 2011

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. Uncertainty distribution is used for

(A) Analysis of multi sample data
(B) Analysis of single sample data
(C) Analysis of both single and multi-sample data
(D) None of the above

b. The voltage of a circuit is measured by a voltmeter having input impedance comparable with the output impedance of the circuit thereby causing error in voltage measurement. The error may be called

(A) Gross error
(B) Random error
(C) Error caused by misuse of instrument
(D) Error caused by loading effect

c. 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)** Low and medium Q coils

d. A chopper stabilized a.c. amplifier may use

(A) bipolar transistors as choppers
(B) an electro mechanical choppers
(C) light activated devices as choppers
(D) all of the above

e. The horizontal amplifier in a CRO should be designed for

(A) high frequency signals with a fast rise time
(B) high amplitude signals with a slow rise time
(C) high amplitude signals with a fast rise time
(D) low amplitude signals with a fast rise time

f. Which one of the following is an active transducer?

(A) Strain guage **(B)** Selsyn
(C) Photovoltaic cell **(D)** photo emissive cell

g. Piezo electric transducers are

(A) Passive transducers **(B)** Active transducers
(C) Inverse transducers **(D)** **(B)** and **(C)**

h. A Hall effect transducer can be used for measurement of

(A) Power **(B)** Current
(C) Displacement **(D)** All of the above

i. An analog transducer has range 0-10 V. Calculate bits of an A/D convertor if the resolution is 5 mV

(A) 10 **(B)** 9
(C) 11 **(D)** None of the above

j. F.M. systems as compared to A.M. systems

(A) Are equally effected by noise
(B) Are less effected by noise
(C) Are more effected by noise
(D) Are highly effected by noise

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

Q.2 a. A circuit requirement for a resistance of 550 ohm is satisfied by connecting together two resistors of nominal values 220 ohm and 330 ohm in series. If each resistor has a tolerance of ±2%, then calculate the most probable maximum percentage error in the equivalent resistance of the series combination. **(8)**

b. What is chopper stabilised amplifier? **(8)**

Q.3 a. The four arms of a bridge are given as :
Arm ab: an imperfect capacitor C_1 with an equivalent series resistance of r_1
Arm bc: a non inductive resistance R_3, *Arm cd*: a non- inductive resistance R_4
Arm da: an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.

A supply of 450 Hz is given between terminals a and c and the dete connected between b and d. At balance R_2=4.8 ohm, R_3=2000 ohm, R_4=2850 ohm and C_2=0.5 micro farad and r_2=0.4 ohm. Calculate the valu of C_1 and r_1 and also find the dissipating factor for this capacitor. **(8)**

b. Draw the circuit diagram and explain with the help of waveforms, a schmitt-trigger based Square wave generator. **(8)**

Q.4 a. A cathode ray tube has and anode voltage of 2000 V and parallel deflecting plates 2 cm long and 5 mm apart. The screen is 30 cm from the centre of the plates. Find the input voltage required to deflect the beam through 3 cm. The input voltage is applied to the deflecting plates through amplifiers having an overall gain of 100. Also calculate the deflection sensitivity of tube. **(8)**

b. Describe in details the function of vertical amplifier used in a Cathode Ray Oscilloscope. What is the bandwidth of an oscilloscope? **(4+4)**

Q.5 a. Draw the block diagram and explain the working of digital counter-timer for measurement of frequency. **(8)**

b. The iron loss in a sample is 300 W at 50 Hz supply with eddy current loss component 5 times as big as the hysteresis loss component. At what frequency will the iron loss be double if the flux density is kept the same? **(8)**

Q.6 a. Explain the bolometer method for measurement of power at radio frequencies. What type of elements does bolometer bridge uses? **(6+2)**

b. What is Quieting Method for sensitivity measurement? What is the meaning of the term quieting? **(4+4)**

Q.7 a. State and explain Hall effect? What are its applications? **(4+4)**

b. Explain the principle of linear variable differential transformer (LVDT). What advantages it has over other types of distance sensors? **(4+4)**

Q.8 a. Explain successive approximation type of D/A convertor. **(8)**

b. What is spectrum analysis? Draw the block diagram of a basic spectrum analyser. **(4+4)**

Q.9 Write short notes on

(i) Analogue and digital instruments
(ii) Systematic and Random errors **(2×8)**