12/29/11 Code: A-20

JUNE 2008

Code: AE12

Time: 3 Hours

Subject: INSTRUMENTATION AND

MEASUREMENT

Max. Marks: 100

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.

0.1	Chanse the	correct or best	alternative	in the	following.	
V.I	Choose the	correct or pest	anemanve	m me	TOHOWING:	

(2x10)

- 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. Schering Bridge is mainly used to measure
 - (A) capacitance

(B) inductance

(C) resistance

- (D) frequency
- c. Audio frequency signal generators mainly employ
 - (A) RC network
 - **(B)** LC network
 - (C) LR network
 - (D) Resistor network
- d. Hall effect probe is used with CRO for the measurement of
 - (A) voltage.

(B) current.

(C) frequency.

- **(D)** modulation index.
- e. Ballistic galvanometer is used in measurement of
 - (A) inductance in a bridge
 - **(B)** capacitance in a bridge
 - (C) resistance in a bridge
 - (D) magnetic flux by induced emf method
- f. The voltmeter used to measure RF power in a load, is essentially
 - (A) a peak reading voltmeter.

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- **(B)** an rms voltage reading device.
- (C) an instrument to measure the change in resistance of a load due to heating.
- (**D**) an instrument to measure VSWR.
- g. Selectivity of a receiver is
 - (A) its ability to prevent image response.
 - **(B)** its ability to maintain constant output power.
 - **(C)** its ability to reject unwanted signals.
 - (**D**) the ratio of input RF and local oscillator frequency.
- h. Wave analyzer is an instrument to measure
 - (A) the frequency difference between fundamental and a harmonic.
 - **(B)** bandwidth of a tuned amplifier.
 - **(C)** frequency shift due to mixing of two frequencies.
 - **(D)** relative amplitudes of frequency components in a signal generator.
- i. The functioning of a thermocouple as a temperature sensor is related to
 - (A) Seeback effect.

- (B) Piezoelectric effect.
- (C) Stefan Boltzmann's law.
- **(D)** Thermal conductivity.
- i. A ratio detector is used for
 - (A) AM alignment.

(B) Sweep alignment.

(C) FM alignment.

(D) Dual sweep alignment.

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

- Q.2 a. Define accuracy and precision. Explain why a precise instrument may not necessarily be accurate. (8)
 - b. What are primary, secondary and working standards? Give examples of each. (8)
- Q.3 a. Draw the circuit of a Schering bridge and derive an expression for value of unknown capacitance in the bridge. Explain how the bridge may be calibrated to directly read dissipation factor of lossy capacitors. (10)
 - b. What is a multimeter? Using simple circuit schemes, show how a wide range of dc voltages and resistances are measured using the meter. (6)
- Q.4 a. Why attenuators are used in a signal generator? List the attenuator types used in sinewave generators. Describe the operation of any one of them. (10)

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Code: A-20 b. Using a circuit diagram, explain the input processing for a frequency counter. **(6) Q.5** Explain the principle under lying the working of a sampling oscilloscope. What are advantages in using sampling scope over conventional oscilloscopes? Draw a block schematic of the sampling system for a CRO. (10)b. Explain how phase angle between two sine waves can be measured using a CRO. **(6) Q.6** Delineate, writing neat figures of an experimental set up, the procedure to measure RF power using a bolometer. (10)Explain a method to obtain the hysteresis loop of a magnetic material under ac operating conditions. Draw figure to show experimental a your set (6)up. **Q.7** a. Draw a neat figure to show the measurement system for AM alignment and write steps in the alignment procedure. **(8)** b. Explain how selectivity of a radio receiver may be measured by sweep method. **(8) Q.8** Draw a figure to illustrate the block schematic of a general purpose spectrum analyzer and explain operation of the analyzer. (10)b. A 10-bit dual-slope A/D converter has a reference voltage of 10V. Find the digital output for an input voltage of 6.8V. **(6)** Explain the phenomenon of 'magneto striction'. Describe the construction and operation of a **Q.9** transducer which works the principle of magneto on striction. (10) $150 \, \mu \text{m/m}$ on b. Find the resistance change produced by the application of strain of (i) a metal wire gauge with GF = 2.0 and (ii) a semiconductor gauge with GF = 140 both of which have a nominal unstrained resistance of 120Ω . **(6)**