



Name :

Roll No. :

Invigilator's Signature :

**CS / B.TECH(EEE/ICE) / SEM-4 / EI-402 / 2010
2010**

ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

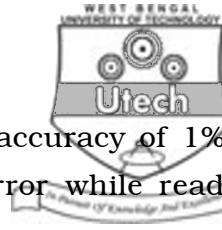
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) Which is not desired characteristics of an instrument ?
 - a) Accuracy
 - b) Fidelity
 - c) Speed of response
 - d) None of these.
- ii) The smallest change in the input variable being measured, that will cause a change in the output signal of the instrument is termed as
 - a) Hysteresis
 - b) Drift
 - c) Resolution
 - d) Threshold.
- iii) For a second order system, the settling time is $\pm 2\%$, band is
 - a) $3/\xi\omega_n$
 - b) $5/\xi\omega_n$
 - c) $2/\xi\omega_n$
 - d) $4/\xi\omega_n$.



- iv) A 0-10A ammeter has a guaranteed accuracy of 1% of full-scale deflection. The limiting error while reading 2.5A is
- a) 1% b) 2%
c) 3% d) 4%.
- v) In an instrument, the smallest measurable input is known as
- a) Threshold b) Resolution
c) Dead zone d) Sensitivity.
- vi) Pirani gauge is used to measure
- a) Temperature b) High pressure
c) Low pressure d) Flow.
- vii) Two resistance $100\Omega \pm 5\Omega$ and $150\Omega \pm 15\Omega$ are connected in series. If the deviations are standard deviation, the resultant resistance can be expressed as
- a) $250\Omega \pm 20\Omega$ b) $250\Omega \pm 10\Omega$
c) $250\Omega \pm 15.8\Omega$ d) $250\Omega \pm 10.6\Omega$.
- viii) In a Q-meter, the value of shunt resistance connected across the oscillator is typically of the order of
- a) Ω b) $m\Omega$
c) $\mu\Omega$ d) $k\Omega$.
- ix) A true rms responding voltmeter is
- a) Thermistor b) RTD
c) LVDT d) Thermocouple.
- x) The spectrum analyzer is used across the frequency spectrum of a given signal to study the
- a) Current distribution b) Voltage distribution
c) Energy distribution d) Power distribution.



- xi) An a.c. voltmeter is used to measure
- | | |
|------------------|------------------------|
| a) average value | b) rms value |
| c) peak value | d) peak to peak value. |
- xii) In a $3\frac{1}{2}$ digit voltmeter, the largest number can be read is
- | | |
|---------|----------|
| a) 0999 | b) 1999 |
| c) 4999 | d) 9999. |

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) Explain the terms 'accuracy' and 'precision' with respect to a measuring system. $2 + 2$
- b) Which is the more desirable parameter ? 1
3. a) Define Linear time invariant and Linear time variant systems with example.
- b) Describe the technique used for linearizing a non-linear system for limited range about the operating point. $1 + 1 + 3$
4. What is limiting error ?
- A Wattmeter having a range of 500 W has an error of ± 1.5 per cent full scale deflection. If true power is 50 W, what would be the range of readings ? $1 + 4$
5. a) State the advantages of the digital voltmeter over analog voltmeter.
- b) What do you mean by $3\frac{1}{2}$ digit display ?
- c) How are DVM classified ? $2 + 2 + 1$
6. a) State sampling theorem.
- b) Why is sample and hold circuit required in a DAS ? Construct a suitable sample and hold (S & H) circuit and explain its function. $1 + 1 + 3$



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What is Histogram ? Explain standard deviation and variance.
b) By using a micrometer screw the following readings were taken of a certain physical length : 1.34, 1.38, 1.56, 1.47, 1.42, 1.44, 1.53, 1.48, 1.40, 1.59 mm.
Assuming that only random errors are present calculate the following :
i) Arithmetic Mean
ii) Average deviation
iii) Standard deviation
iv) Variance. $(2 + 2 \times 2) + 9$
8. a) What is ADC ? Draw the schematic of a Dual ramp ADC circuit.
b) Explain R/2R ladder network for D to A conversion.
c) Why is R/2R ladder network technique better than weighted resistor technique ?
9. a) With the help of a functional block diagram, explain the working principle of a swept TRF spectrum analyzer.
b) What is Standard Hydrogen Electrode (SHE) ? Where is it applied and for what purpose ? Draw a schematic diagram of this instrument. $7 + 2 + 2 + 4$
10. a) What are the objectives of Data Acquisition system ?
b) Draw the block diagram of a generalized DAS and also write the name of the components of signal conditioner used in Data Acquisition System.
c) What is analog multiplier ? Explain the function of analog multiplier as divider and frequency doubler. $3 + 5 + 2 + 5$
11. Write short notes on any *three* of the following : 3×5
a) 'Q' meter
b) Log Amplifier
c) Function Generator
d) Error in Measurement
e) Instrumentation Amplifier
f) Multiplexing.
-