

**CS/B.TECH/EIE(New)/SEM-6/EI-602/2013**

**2013**

**ELECTRONIC INSTRUMENTATION AND  
MEASUREMENT**

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 Question)**

1. Choose the correct alternatives for the following: 10 x 1 = 10
  - i) Charge amplifier is used in
    - a) Hall effect transducer
    - b) Piezoelectric transducer
    - c) VCO
    - d) Successive approximation type DVM.
  - ii) The accuracy of a digital frequency meter is usually stated as
    - a)  $\pm 1 \text{ LSD} \pm \text{time base error}$
    - b)  $\pm 2 \text{ LSD} \pm \text{time base error}$
    - c)  $\pm 3 \text{ LSD} \pm \text{time base error}$
    - d)  $\pm 4 \text{ LSD} \pm \text{time base error}$ .
  - iii) What type of noise is found in semiconductor devices?
    - a) Shot noise
    - b) Thermal noise
    - c) Johnson noise
    - d) None of these.

- iv) In a ballistic galvanometer, damping follows
- a) hyperbolic decay
  - b) exponential decay
  - c) logarithmic decay
  - d) exponential rise.
- v) The commonly used PLL chip is
- a) NE500
  - b) LM522
  - c) NE565
  - d) NE465.
- vi) Operating temperature range of an LCD is
- a) wide, 0 – 70 degree centigrade
  - b) restricted, 10 – 30 degree centigrade
  - c) more than 70 degree centigrade
  - d) restricted, less than 10 degree centigrade.
- vii) Brightness of a CRO is adjusted by controlling
- a) Grid voltage
  - b) Anode voltage
  - c) Filament current
  - d) none of these.
- viii) For measurement of low impedance components by Q-meter, the component is connected in
- a) parallel
  - b) series
  - c) direct
  - d) both series and parallel.

- ix) The combination of sampling and storage oscilloscope is called
- a) dual traces CRO                      b) simply CRO  
c) DSO    d) time base oscilloscope
- x) The LEDs for their display require
- a) a voltage of 1.2V and a current of 20mA  
b) a voltage of 25V and a current of 20mA  
c) a voltage of 25V and a current of 100mA  
d) a voltage of 1.2V and a current of 100mA.
- xi) What type of device is used in VCO?
- a) Zener diode                              b) Varactor diode  
c) Triac    d) None of these.
- xii) Spectrum analyzer is a combination of
- a) narrow band superheterodyne receiver and CRO  
b) signal generator and CRO  
c) oscillator and wave analyzer  
d) none of these.

### **GROUP – B**

#### **(Short Answer Type Questions)**

Answer any *three* of the following.                      3 x 5 = 15

2. a) What is current mirror?  
b) Draw the circuit diagram of current mirror circuit and explain the operating principle.                      1 + 1 + 3
3. With diagram, explain the operation of frequency to voltage converter.

4. What is virtual instrumentation? What are the advantages of it over conventional system? 2 + 3
5. What is chopper Amplifier? How does it work for D.C. amplification? 1 + 4
6. What is noise? What are the different types of noise? Derive the expression of thermal noise in a resistor? 2 + 1 + 2

### GROUP – C

#### (Long Answer Type Questions)

Answer any *three* of the following. 3 x 15 = 45

7. a) What is the operating principle of LCD display?  
 b) What are the advantages of LCD display over LED display?  
 c) Explain why reflective LCDs have advantages over transmissive LCDs.  
 d) Explain with the help of a neat diagram, the working of a digital frequency meter. 4 + 3 + 4 + 4
8. a) Explain the operation of a dual slope integrating type digital voltmeter. How does the range changing circuits work for a DVM?  
 b) With the help of a block diagram, explain the working principle of a true RMS meter.  
 c) A symmetrical square wave is read on an average responding type electronic voltmeter whose scales are calibrated in terms of rms value of sinusoidal wave. Calculate the following:  
 i) The form of a square wave voltage.  
 ii) The percentage error in reading. 6 + 5 + 2 + 2

9. a) Define the Q-factor of a coil. Explain with a circuit diagram, the construction and principle of operation of a basic Q meter.
- b) Find the self-capacitance of a coil by Q meter, the resonance was obtained with:
- i) tuning capacitor of 1530 pF at 1.0 MHz
- ii) tuning capacitor of 162 pF at 3.0 MHz.
- c) What are the errors present in Q meter?

1 + 7 + 4 + 3

10. a) Why is the square waveform preferred over sinusoidal one at the PLL input?
- b) Derive the expression for Lock-in Range of PLL.
- c) A digital frequency meter has time base derived from a 1 MHz clock generator frequency divided by decade counters. Determine the measured frequency, when a 1.5 kHz sine wave is applied and time base uses
- i) six decade counter
- ii) four decade counter.

3 + 7 + 5

11. Write short notes on any *three* of the following: 3 x 5
- a) Digital storage oscilloscope
- b) Log amplifier
- c) Johnson noise
- d) Programmable gain amplifier
- e) VCO
- f) True RMS meter.

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