2014

Electronic Instrumentation and Measurement

Time Alloted : 3 Hours *Full Marks : 70*

The figure 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 10x1=10

   i) In a Phase Lock loop

      a) capture range is similar than lock range
      b) lock range is smaller than capture range
      c) capture range is equal to lock range
      d) none of these.

   ii) Spectrum analyzer is used across the frequency spectrum of a given signal to study the

      a) current distortion
      b) voltage distortion
      c) energy distortion
      d) power distortion

   iii) What type of noise is found in semiconductor device?

      a) Shot noise b) Thermal noise
      c) Johnson noise d) None of these

iv) The commonly used PLL chip is

a) NE 500 b) NE 565
c) LM 522 d) NE 465

v) Bolometer is used to measure

a) power b) frequency
c) temperature d) current

vi) An a.c. voltmeter is used to measure

a) average value b) RMS value
c) peak value d) peak-peak value

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 LED's 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) The circuit generally used in digital instruments to convert sine waves into rectangular pulses is

a) Saw tooth generator b) Differential amplifier
c) Sample and hold circuit d) Schmitt Trigger.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. a) Why is a coil of high 'Q' preferred over a coil of low 'Q'?

   b) Compare a true-rms with an average responding meter. (2+3)

3. With the help of a block diagram, explain the operation of a frequency to voltage converter. (5)

4. How do you measure a.c voltage using a true rms voltmeter? (5)

5. a) Sketch an LED seven segment display.

   b) Explain common cathode and common anode LED display. (2+3)

6. What is virtual instrumentation? What are the advantages of it over conventional system? (5)

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3x15=45

7. a) Explain the working of a Digital Storage Oscilloscope with the help of a block diagram.

   b) Draw the block diagram of a Dual Trace Oscilloscope and explain the same.

   c) Find the expression for the deflection sensitivity of a CRO. (5+5+5)

8. a) With the help of a block diagram, explain the operation of a VCO.

   b) Explain the three states of a PLL briefly.

   c) With the help of a functional block diagram, explain the working principle of a swept TRF spectrum analyzer.

   d) What are the controls and specifications of a spectrum

analyzer?

(4+3+5+3)

9. a) With the help of a block diagram, explain the operation of a dual slope integrating type digital voltmeter.

   b) Draw the circuit for a FET input voltmeter using dual emitter and explain its operation.

   c) Determine the meter reading of a FET input voltmeter, when E = 7.5 V, and the meter is set to its 10 V range. The FET gate-source voltage is -5 V, V_p =+5 V, $R_s + R_m$ = 1 kΩ and, I_m = 1 mA at full scale

   (6+2+3+4)

10. a) Mention the disadvantages of electrical voltmeters over electronics Voltmeters.

    b) Explain the operating principle of a swept superheterodyne spectrum analyzer.

    c) Define the term "harmonic distortion".

    d) Calculate the distributed capacitance of the Q meter circuit when the following measurements are made:

    During the measurement of Q of a coil, at 2 MHz frequency the tuning capacitor is set at 600 pF and at 8MHz frequency the tuning capacitor is tuned at 80 pF.

    Also calculate the value of the actual Q from the value of distributed Capacitor

    (2+6+2+5)

11. Write short notes on any three of the following:

    (3x5)

    a) Current mirror

    b) Charge amplifier

    c) Programmable gain amplifier

    d) Working principle of LCD display

    e) Distortion meter

    f) Q-meter