Total number of printed pages–5

53 (IE 504) ELIN

2021

ELECTRONIC INSTRUMENTATION

Paper : IE 504

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Draw the circuit of transistor based D.C. voltmeter and describe its operation in brief. Write relevant expressions. 7

   (b) Name the stages of A.C. voltmeter circuit and explain the function of each stage using a suitable diagram. 7

   (c) How an unknown inductance or capacitance is measured in a Q-meter by direct connection ? Explain with an example. 6

2. *(a)* Name the major sections of vector voltmeter. Explain each of them. 10

Contd.

(b) What is the function of the following in an Oscilloscope — 10

(i) Delay line

(ii) Horizontal deflection subsystem

(iii) Focus and intensity control

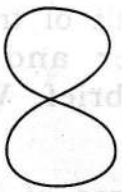
(iv) Position control

(v) Vertical sensitivity ?

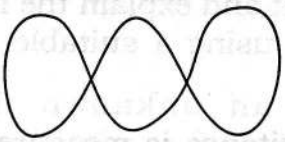
3. (a) How voltage, current and time measurements are done using oscilloscope ? 6

(b) From the following Lissajous figures, determine the ratio of f_y/f_x. 6

(i)



(ii)



(iii)

(c) With the help of a suitable block diagram, describe the working of a digital storage oscilloscope. 8

4. (a) A $5V$ signal with a source resistance of $R_s = 200\Omega$ is measured with the help of an oscilloscope of input impedance $R_i = 2M\Omega$ in parallel with $C_i = 50pF$. The coaxial cable has a capacitance of $C_{cc} = 50pF$.

Calculate the input voltage of the oscilloscope when the signal frequency is

(i) $10Hz$

(ii) $10kHz$. 6

(b) Describe the working of spectrum analyzer using a suitable diagram. Also draw the display diagram of the analyzer. 8

(c) Describe a method to analyze harmonics in a waveform. 6

5. (a) Draw the circuit diagram of square wave generator using: 10

(i) OPAMP

(ii) Transistor

Describe briefly the working in each case.

(b) How function generator generates different waveforms with variable frequency? Explain with a diagram. 10

6. (a) Describe the working of digital voltmeter using a suitable method. Also draw the system waveform. 8

(b) An analog instrument has a range of 0–30 *V* and its accuracy is ±1% of full scale deflection. A digital instrument has a 4½ digit display and an accuracy of ± (0·5+1). If a voltage of 10 *V* is to be measured using the analog and digital instrument, what will be the measurement accuracy in each case? 6

(c) Draw the following circuit using operational amplifier: 6

(i) Differential Amplifier

(ii) Integrator

(iii) Voltage to current converter.

7. (a) Write short notes on: ***(any two)*** 7×2=14

(i) Sampling oscilloscope

(ii) True RMS responding voltmeter

(iii) Frequency synthesize size wave generator

(iv) Digital frequency meter.

(b) What are the causes of interferences in an electronic instrument? Explain in brief. 6