

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

CMRIT LIBRARY
BANGALORE - 560 037

15EC35

Third Semester B.E. Degree Examination, June/July 2018 Electronic Instrumentation

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Briefly explain Gross Errors, Absolute error and relative error with examples. (05 Marks)
- b. Draw the block diagram of a true RMS voltmeter and explain its operation. (05 Marks)
- c. Design a multirange ammeter using Ayrton Shunt for the ranges 0 – 10 mA, 100 mA and 1 A, using a D'Arsonval movement having internal resistance of 1 K Ω and a full scale current of 100 μ A. (06 Marks)

OR

- 2 a. Sketch and explain the operation of a multirange ammeter using Ayrton shunt. (05 Marks)
- b. A resistor of 1 K Ω with an accuracy of $\pm 5\%$, carries a current of 10 mA. The current is measured with an ammeter of 30 mA full scale with an accuracy of $\pm 2\%$ at full scale. Calculate the power dissipation in the resistor and the accuracy of the power measurement. (05 Marks)
- c. What is the loading effect of a voltmeter of low sensitivity? A voltage of 100 V dc is applied across a series combination of two resistors R1 and R2 each of 10 K Ω . A voltmeter of sensitivity 1 K Ω /V is used to measure the voltage across R2 in the range of 50 V. Calculate the voltmeter reading and percentage error of reading. (06 Marks)

Module-2

- 3 a. Describe with diagram the operation of a Ramp type DVM. What are its limitations? (08 Marks)
- b. (i) With the help of a block diagram, explain the operation of a digital time period measurement instrument.
- (ii) The lowest range of a $4\frac{1}{2}$ digit DVM is 10 mV full scale. Determine its sensitivity. (08 Marks)

OR

- 4 a. Describe with diagram, the operation of a successive approximation type DVM. (08 Marks)
- b. (i) With the help of a block diagram, explain the operation of a digital capacitance meter. (08 Marks)
- (ii) What are the outstanding characteristics of a DVM?

Module-3

- 5 a. Draw the block diagram of a simple CRO and state the functions of each block. What is the advantage of using $-ve$ HV supply in CRO? (08 Marks)
- b. Explain with the help of a block diagram of a function generator, how it generates the different waveforms. (08 Marks)

- 6 a. (i) Describe the operation of a digital storage oscilloscope with the help of a block diagram.
(ii) The number of vertical and horizontal tangencies of a Lissajous figure are 2 and 6 respectively. What is the frequency of the signal connected to vertical plates, if horizontal plate signal frequency is 1 kHz. (08 Marks)
- b. Sketch the block diagram of a square and pulse generator and describe how it generates the square waveform and pulses. (08 Marks)

Module-4

- 7 a. (i) Explain with diagram the working of a phase sensitive detector. (08 Marks)
(ii) What is the principle of working of a stroboscope? (08 Marks)
- b. Draw the circuit of a Wheatstone's bridge and explain how it can be used to measure an unknown resistance. (05 Marks)
- c. If the two arms of a Wheatstone's Bridge are $R_1 = 1 \text{ K}\Omega$ and $R_2 = 10 \text{ K}\Omega$. Find the range of the third arm resistance R_3 to be used to measure unknown resistance R_4 of the range $1 \text{ K}\Omega$ to $100 \text{ K}\Omega$, in the fourth arm. (03 Marks)

OR

- 8 a. Define Q factor. With diagram, explain the operation of a Q meter to measure Q and inductance of a coil. (08 Marks)
- b. Draw the diagram of a Maxwell's Bridge and obtain the equations to measure R_x , L_x and Q. (05 Marks)
- c. A Maxwell's Bridge has components values at balance as $C_1 = 0.01 \mu\text{F}$, $R_1 = 470 \text{ K}\Omega$, $R_2 = 5.1 \text{ K}\Omega$, $R_3 = 100 \text{ K}\Omega$. Find the value of the inductive impedance connected in the fourth arm (R_x and L_x). (03 Marks)

Module-5

- 9 a. Explain the operation of a resistive position transducer. (05 Marks)
- b. Describe with diagram the operation of a piezo electric transducer. (05 Marks)
- c. With circuit diagram, explain the operation of a LVDT the method of measuring displacement. (06 Marks)

OR

- 10 a. (i) Explain with diagram the construction of a Bonded Resistance wire gauge. How does it senses strain/stress?
(ii) How it is used in a bridge arrangement with a dummy gauge and what is the advantages of such an arrangement? (08 Marks)
- b. Briefly explain the construction and operation of a photoconductive cell and a photo transistor. (04 Marks)
- c. With a circuit explain how a photo transistor can be used to operate a street light relay. (04 Marks)

* * * * *