Total number of printed pages: **3** **UG/Sixth Semester/UIE602**

2023

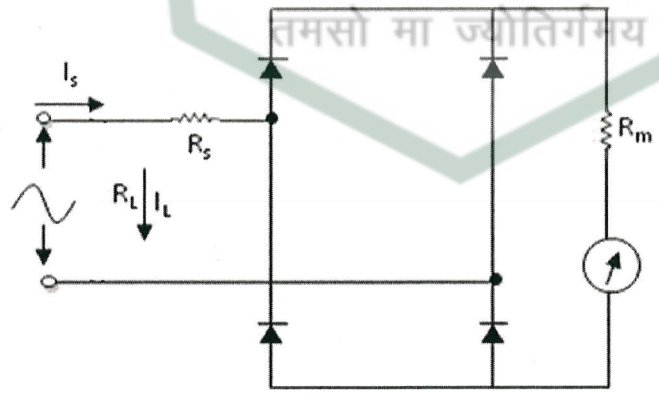
ELECTRONIC INSTRUMENTATION

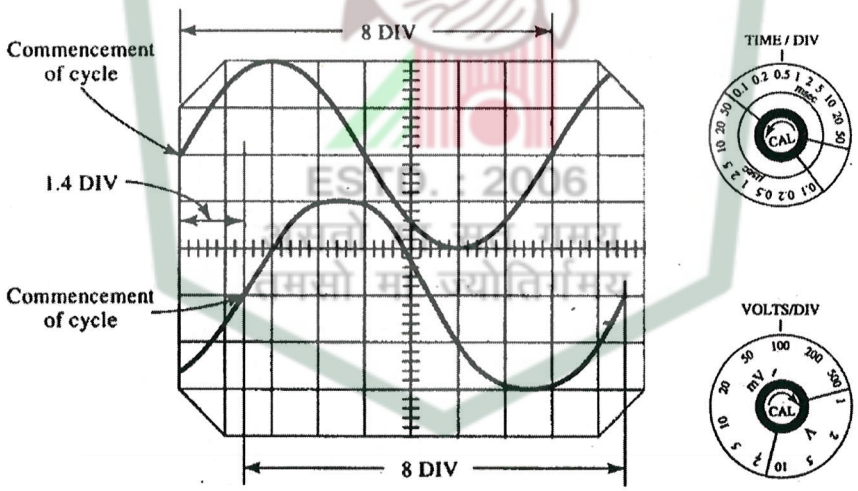
Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1.	a)	Discuss how the effect of temperature can be reduced in a dc ammeter. A PMMC instrument with FSD of 100 μA and a coil resistance of 2 kΩ is to be converted into a voltmeter. Determine the required multiplier resistance if the voltmeter is to measure 50V at full scale. Also calculate the applied voltage when the instrument indicates 0.5 and 0.8 FSD.	2+4=6
	b)	Explain how the quality (Q) factor of a coil is measured? Determine the Q factor and voltmeter indication for a coil of resistance R=10 Ω and X_L=150 Ω at resonance, if supplied voltage V=100 mV	4+3=8
	c)	A PMMC instrument with FSD= 100 μA and R_m= 1 kΩ is to be used as an ac ammeter with FSD =100 V(rms). If Silicon diodes are used in the bridge rectifier circuit, calculate the multiplier resistance value. 	6
2	a)	How does a true RMS meter based on thermocouple work?	5
2	b)	Explain the working principle of LC oscillators. With the help of circuit diagram explain how a triangular wave can be generated?	3+6=9

2	c)	What are the characteristics of voltage and frequency of a sweep frequency generator? Describe the operation of a sweep frequency generator.	1+5=6
3.	a)	What are the different types of noises encountered in electronic instruments? How does a phase-locked loop work-explain with the help of block diagram.	2+7=9
	b)	Define total harmonic distortion. What is the difference between a signal analyzer and a spectrum analyzer? What do you mean by heterodyning? Explain the working principle of a frequency selective wave analyzer.	2+2+2+5 = 11
4	a)	What are the differences between CRO and DSO? Explain the operation of CRO with the help of necessary diagram.	2+6=8
	b)	Draw the equivalent circuit diagram of signal source, probe and oscilloscope inputs. Is it preferable to have low input impedance at the inputs of the oscilloscope? Draw the Lissajous pattern if *i*) both the horizontal and vertical inputs are sinusoidal with no phase difference between them and if *ii*) both the vertical and horizontal inputs are sinusoidal with horizontal input delayed by 90° to the vertical input.	2+1+4=7
	c)	From the following diagram, determine the V_{pp} (in mV), time period (sec), frequency of the first waveform, and the phase difference between the two waveforms (in degree) 	5
5	a)	With the help of diagram explain how a storage type analog CRO works?	6
	b)	Explain how a sampling oscilloscope reduces the frequency of a signal to a lower level? What is the main disadvantage of a sampling oscilloscope?	5+1=6
	c)	Give a detailed explanation on the working principle of a DSO.	8
6	a)	Determine the quantization error of a 4 bit ADC? Which type of ADC can give fastest conversion of data? How does a R-2R network type DAC converts digital inputs into analog voltage-explain with circuit diagram.	1+1+6=8

6	b)	Illustrate the steps by which ramp type digital voltmeter provide digital voltage reading.	6
6	c)	What is the function of latch in digital display of readings? A digital frequency meter has a time base derived from a 1 MHz clock generator frequency-divided by decade counters. Determine the measured frequency when 253 Hz sine wave is applied and time base uses four decade counters.	2+4=6
7	a)	Give a brief description on IEEE 488 bus. What are the functions of a data logger? Explain the operation of galvanometric strip chart recorder based on PMMC instrument.	2+2+6=10
7	b)	Write short notes on any two of the following: i) Heterodyne harmonic analyzer ii) Digital frequency meter iii) Magnetic tape recorder	2×5=10