MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2013 Certified)

WINTER – 2022 EXAMINATION
Model Answer

Subject Name: Electronics Instruments and Measurements **Subject Code:** 22331

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.
8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students in first year (first and second semesters) write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q.1		**Attempt any Five of the following:**	**10 M**
	a)	**Define Calibration of Instrument.**	**2M**
	Ans	Calibration: The process of deriving the value of a quantity by comparing that quantity with the standard quantity is called calibration. Calibration of instrument is done to obtain correct unknown value of each scale reading on the measuring instrument.	**2M for Definition)**
	b)	**Differentiate between PMMC and PMMI (any two points).**	**2M**

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Ans

Any 2-1M each

Parameters	PMMC (Moving Coil Instrument)	PMMI (Moving Iron Instrument)
Definition	A measuring instrument which involves the movement of a coil in a magnetic field of a permanent magnet to measure the electric current or voltage is called a moving coil instrument or M. C. instrument or PMMC instrument.	The measuring instrument in which a core of soft iron moves in a magnetic field of an electromagnet to measure the electrical current or voltage is called moving iron instrument or M. I. instrument.
Principle	When the current carrying conductor is placed in a magnetic field, it experiences a force.	Piece of iron is attracted /repelled by a magnet or magnetic field.
Torque/ Weight ratio	Higher	Lower
Application	PMMC instruments are used for only DC measurements.	Used for DC as well as AC measurements
Cost	Higher cost for the same range.	Lower cost for same range
Sensitivity	More sensitive	Comparatively less sensitive
Used as	Moving coil instruments are mainly used as a measuring instrument for DC.	Moving iron instruments are mainly used as an indicating instrument.
Power consumption	Moving coil instruments consumes less power.	Moving iron instruments consumes high power.
Scale	Uniform	Non-uniform

c) **Define Resolution and Sensitivity.** **2M**

Ans

Resolution: The smallest change in input to which instrument can respond is known as resolution.

ii) **Sensitivity**: The ratio of change in output of an instrument to the change in input is known as sensitivity. Sensitivity = Change in output/ Change in input

1 M for Each Definition

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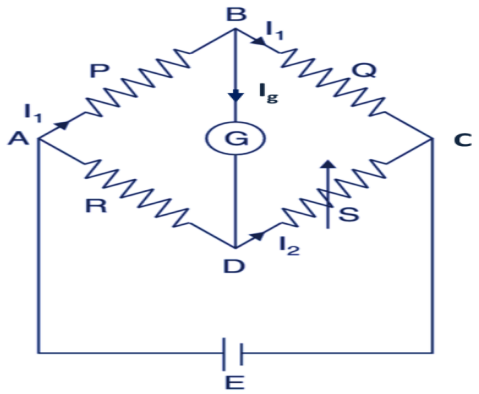
	d)	**Write four specifications of CRO.**	**2M**
		Specifications of CRO : 1. Bandwidth : DC - 20MHz 2. Sensitivity :1mV/div on Both Channels 3. CH1, CH2 (Independent Channels), 4. CH1 & CH2 (Alternate / CHOP), CH2 INVT, ADD and SUBTRACT 5. X-Y Operation 6. Time Base : 40ns/div to 0.2s/div 7. 140mm Rectangular CRT with Internal Graticule 8. Triggering to 40MHz 9. Z Modulation (TTL Level) 10. Display :8 x 10 cm 11. TV Triggering Frame (V) & Line (H) Line Trigger 12. Power : 230 V ± 10% 50 Hz 30W.	(any 4-1M each)
	e)	**State significance of Lissajous figure.**	**2M**
	Ans	Lissajous figure is used For i) measurement of unknown frequency ii) measurement of Phase difference between two signals	**1M each**
	f)	**Draw the diagram of Wheatstone Bridge.**	**2M**
	Ans		**2M for proper diagram**

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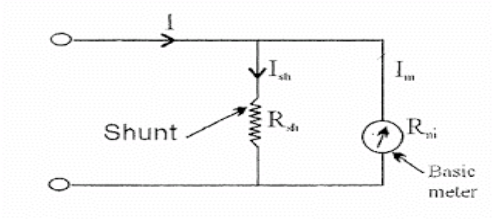
	g)	**Write the function of the delay line in CRO.**	**2M**
	Ans	All the electronic circuits which are used in the oscilloscope like attenuators, amplifiers, etc. take a certain time for the required operation. So, whenever a signal is transmitted through these circuits, a certain time delay occurs. The horizontal section consists of a trigger circuit, sweep generator and amplifier. The time delay which takes place in the horizontal deflection system is about 80 ns. So, a time delay of 80 ns or more should be added in the vertical deflection system for synchronization of reaching input signal at same time to both the plates in CRT. Generally, a time delay of 200 ns is provided to observe the leading edge of waveforms.	2 M Proper function-
Q.2		**Attempt Any THREE of the following**	**12M**
	a)	**Describe the different types of errors occurs in measurement.**	**4M**
	Ans	1. **Static error :** The error which occurs in stationary condition is called a static error. These are classified as: i. **Gross errors**: The errors which occur due to human mistakes while taking reading, handling instrument incorrect setting or adjustment and improper use of instrument are known as gross errors. The complete elimination of gross errors is not possible but we can minimize it. These errors are also called personal errors. These errors may be avoided by taking reading and recording it carefully, by taking more than two readings, by proper handling of instruments. ii. **Systematic errors:** these errors occur due to shortcoming of the instrument such as defective or worn part or aging or effect of environment on the instrument. a. **Instrumental error:** the errors which arise due to inherent shortcoming of instrument, misuse of instrument, loading effect of instrument are called instrumental error. These errors can be removed by, selecting suitable instrument for particular application, selection of correct setting on the instrument, calibrating the instrument against standard, applying correction factor after the determination of instrumental error. b**. Environmental error:** these errors occur due to external conditions to the measuring instrument, such as temperature, pressure, humidity, dust and external magnetic field. This error can be avoided by keeping surrounding conditions	01 Mark for types 02 Marks for explan ation (01 mark for explain ation of each

		constant with the help of air conditioning, temperature control, enclosure, etc. and using proper magnetic shielding. c. **Observation error:** these are introduced by the observer. The most common error is the parallax error introduced in reading a meter scale. These errors can be removed by taking reading carefully, using mirror scale and having the pointer and scale in the same plane, and using digital instruments. iii. **Random error:** These errors are due to unknown causes which are not determinable. These errors remain after gross and systematic errors have been substantially reduced. Generally these errors are very small in nature. **2. Dynamic error:** the difference between true value of a quantity changing with time and value indicated by instrument if no static error is assumed is called dynamic error.	type)
	b)	**Explain the role of shunt resistor connect across PMMC movement.**	**4M**
	Ans	Let, R_m = Internal resistance of movement (coil) I_m I_{fs} = full scale deflection current of movement R_{sh}= Resistance of shunt I_{sh} = Shunt current I = current to be measured  PMMC configured as an ammeter equivalent circuit When a PMMC (Permanent Magnet Moving Coil) is configured as an ammeter, a shunt resistor is connected to it, to adjust the range of measurement. The value of the shunt resistor depends on the current range the device is going to measure. To measure a higher amount of current connect a low value resistance in parallel with PMMC movement. Select the value of shunt resistance in such a way that it will absorb major current through it and only current required for basic movement will pass through it. Thus the overall resistance of the circuit is less. (R_{sh} ll R_m) The voltage drop across the meter movement, Vm = Im Rm	2M diagram 2M explainati on

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		Since the shunt resistor is parallel with the moving coil, Vm = Vsh The current through the shunt , Ish = I – Im Therefore, the value of the shunt is, Vm = Vsh Im Rm= Ish Rsh Thus, Rsh = $\frac{Im\,Rm}{Ish} = \frac{Im\,Rm}{I - Im}$	
	c)	**Describe the function of each block of CRO.**	**4M**
	Ans	The main blocks of CRO are : 1. Cathode ray tube 2. Vertical amplifier 3. Delay line 4. Time base generator 5. Horizontal amplifier 6. Trigger circuit 7. Power supply **Cathode Ray Tube:** It is the heart of the oscilloscope. When the electrons emitted by the electron gun strikes the phosphor screen, a visual signal is displayed on the CRT. **Vertical Amplifier -** The input signals are amplified by the vertical amplifier. Usually, the vertical amplifier is a wide band amplifier which passes the entire band of frequencies. **Delay Line:** As the name suggests, this circuit is used to delay the signal for a period of time in the vertical section of CRT. The input signal is not applied directly to the vertical plates because the part of the signal gets lost, when the delay time is not used. Therefore, the input signal is delayed by a period of time. **Time Base (Sweep) Generator:** Time base circuit uses a unijunction transistor, which is used to produce the sweep. The saw tooth voltage produced by the time base circuit is required to deflect the beam in the horizontal section. The spot is deflected by the saw tooth voltage at a constant time dependent rate. **Horizontal Amplifier:** The saw tooth voltage produced by the time base circuit is amplified by the horizontal amplifier before it is applied to horizontal deflection plates.	any 4- 1M each

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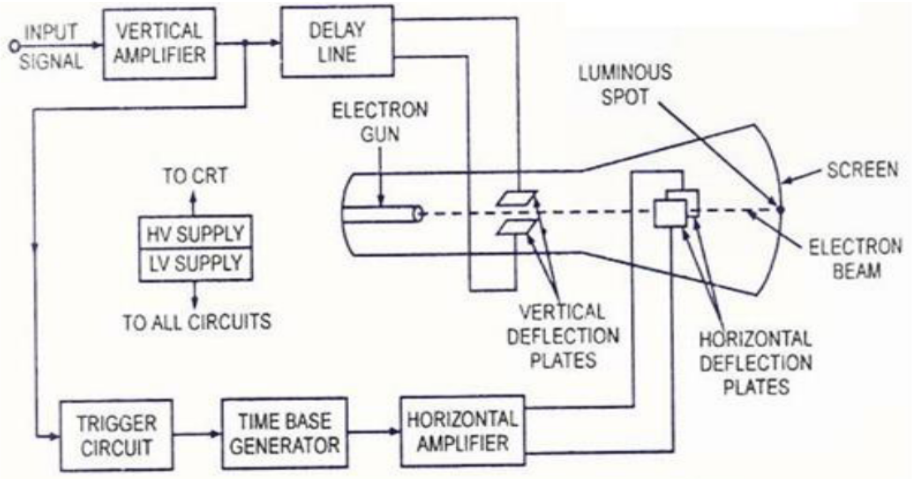
Trigger Circuit: The signals which are used to activate the trigger circuit are converted to trigger pulses for the precision sweep operation whose amplitude is uniform. Hence input signal and the sweep frequency can be synchronized.

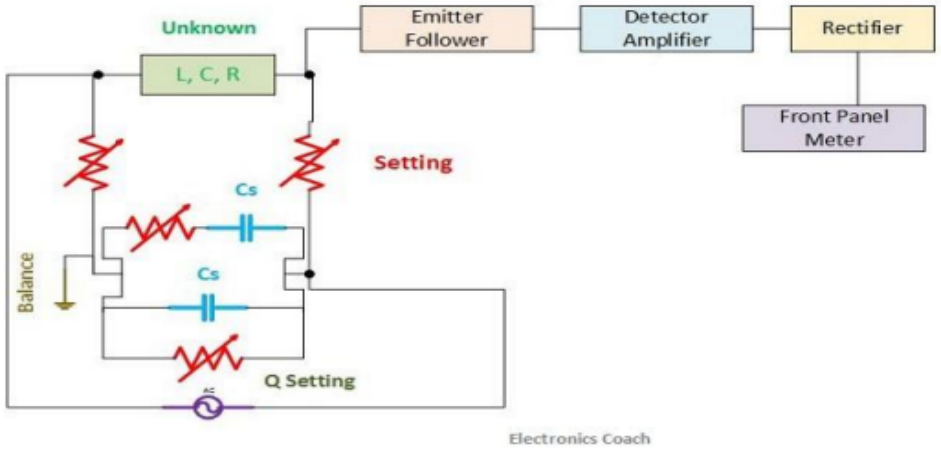
Power supply: The voltages required by CRT, horizontal amplifier, and vertical amplifier are provided by the power supply block. It is classified into two types - (1) Negative high voltage supply (2) Positive low voltage supply The voltage of negative high voltage supply is from -1000V to -1500V. The range of positive voltage supply is from 300V to 400V.

Diagram optional



d) Describe LCR meter with block diagram. **4M**

Ans



2M - block diagram

2M explanation

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		The above block diagram clearly defines the connection diagram of the LCR meter. The measurement of DC quantities will be done by exciting the bridge with DC voltage. On the contrary, the AC measurements require excitation of the Wheatstone bridge with AC signal.For providing AC excitation, the oscillator is used in the circuit. It generates the frequency of 1 kHz. The bridge is adjusted in null position in order to balance it completely. Besides, the sensitivity of the meter should also be adjusted along with balancing of the bridge. The output from the bridge is fed to the emitter follower circuit. The output from the emitter follower circuit is given as an input to detector amplifier.The significance of detector amplifier can be understood by the fact that if the measuring signal is low in magnitude, it will not be able to move the indicator of PMMC meter. Thus, in order to achieve the sustainable indication we need to have a high magnitude measuring signal. But it is often observed that while dealing with the measurement process, the magnitude of the measuring signal falls down due to the attenuation factor. The problem with this solution is to utilize an amplifier.The rectifier is used in the circuit to convert the AC signal into DC signal. When the bridge is provided with AC excitation then at the output end of the bridge the AC signal needs transformation into DC signal.	
Q.3		**Attempt any Three of the following**	**12 M**
	a)	**Explain with sketches the working of analog ohm meter.**	**4M**

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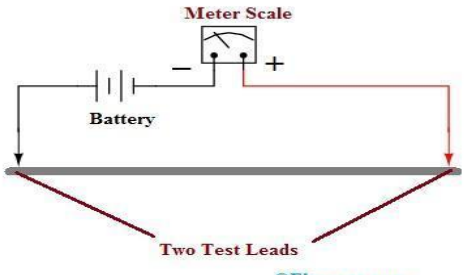
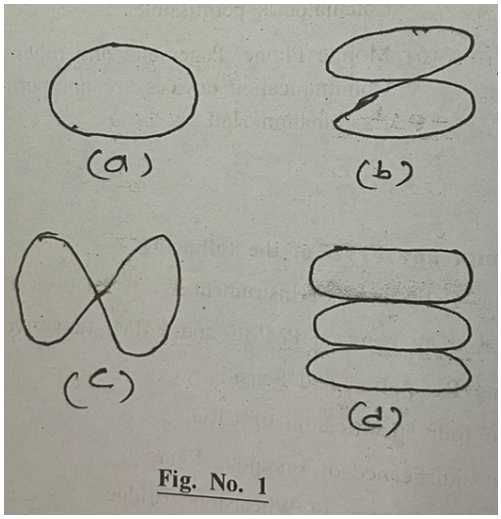
	Ans	The working principle of ohmmeter is, it comprises a needle and two test leads. The needle deflection can be controlled with the battery current. Initially, the two test leads of the meter can be shorted together to calculate the resistance of an electrical circuit. Once the two leads of the meter are shorted, then the meter can be changed for appropriate action in a fixed range. The needle comes back to the highest point on the meter scale, and the current in the meter will be highest. An ohmmeter circuit diagram is shown below.  Once the testing of the circuit is done then the test leads of the meter must be detached. Once the two test leads of the meter are connected to the circuit then the battery gets discharged. When the test leads get shorted then the rheostat will be adjusted. The meter needle can be reached to the lowest position that is zero, and then there will be zero resistance among the two test leads.	Working--3 marks Sketch-1 mark
	b)	**Calculate horizontal to vertical frequency ratio for Lissajous figures as shown in Figure No. 1**  Fig. No. 1	**4M**

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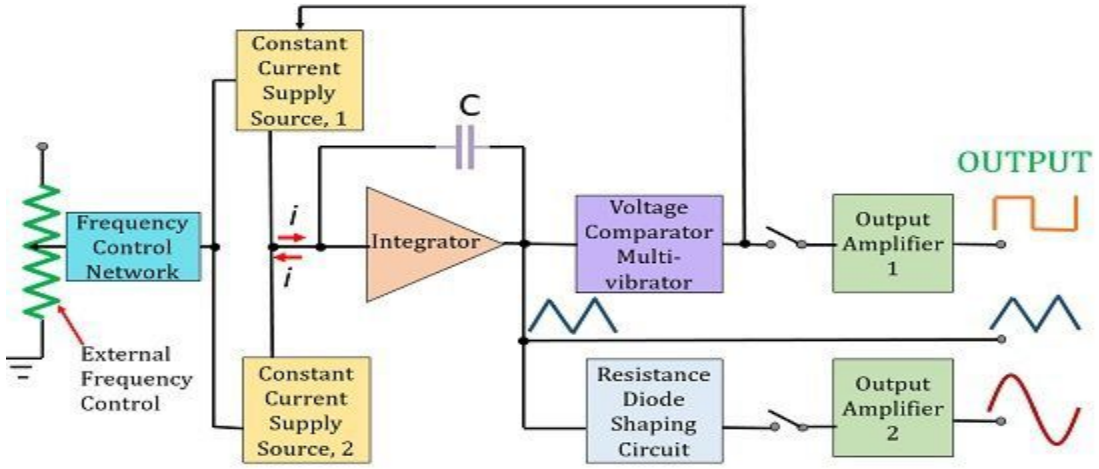
	Ans	a) 1:1 b) 1:2 c) 2:1 d) 1:3	Each 1 mark
	c)	**Draw the block diagram of the function generator.**	**4M**
	Ans		Correct diagram- 4 marks
	d)	**Draw the block diagram of Maxwell Bridge Circuit, write the equation of balance.**	**4M**
	Ans	The bridge used for the measurement of self-inductance of the circuit is known as the Maxwell bridge. It is the advanced form of the Wheatstone bridge. The Maxwell bridge works on the principle of the comparison, i.e., the value of unknown inductance is determined by comparing it with the known value or standard value **Maxwell's Inductance Bridge** In such types of bridges, the value of unknown resistance is determined by comparing it with the known value of the standard self-inductance.	Diagram- 2 marks Equation- 1 marks Explain-1 mark

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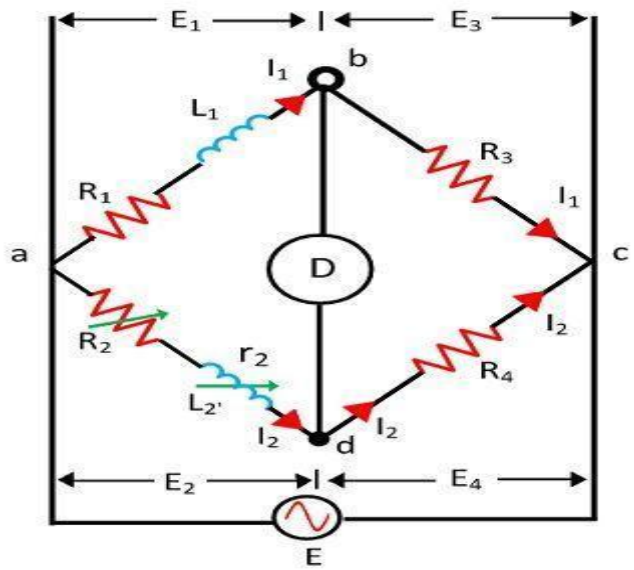

Let, L1 – unknown inductance of resistance R1.
L2 – Variable inductance of fixed resistance r1.
R2 – variable resistance connected in series with inductor L2.
R3, R4 – known non-inductance resistance

$$L_1 = \frac{R_3}{R_4} L_2$$

At balance,

$$R_1 = \frac{R_3}{R_4}(R_2 + r_2)$$

OR

Maxwell's Inductance Capacitance Bridge

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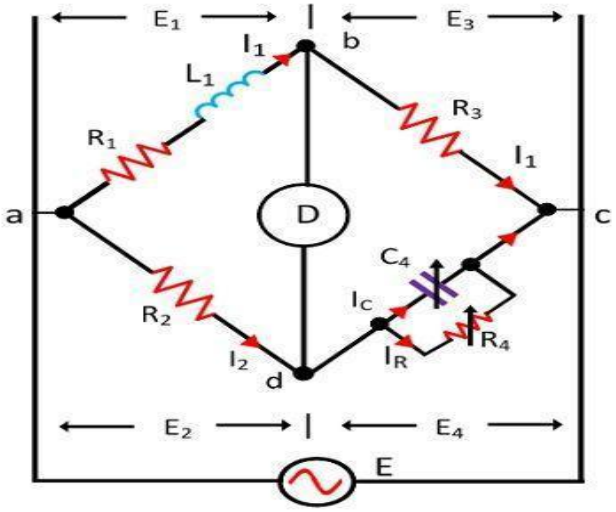
In this type of bridge, the unknown resistance is measured with the help of the standard variable capacitance.



Let, L1 – unknown inductance of resistance R1.
R1 – Variable inductance of fixed resistance r1.
R2, R3, R4 – variable resistance connected in series with inductor L2.
C4 – known non-inductance resistance

$$(R_1 + j\omega L_1)\left(\frac{R_4}{1 + j\omega C_4 R_4}\right) = R_2 R_3$$

$$R_1 R_4 = j\omega L_1 R_4 = R_2 R_3 + j\omega C_4 R_4 R_2 R_3$$

For balance condition,

By separating the real and imaginary equation we get,

$$R_1 = \frac{R_2 R_3}{R_4}$$

$$L_1 = R_2 R_3 C_4$$

Q.4		Attempt Any THREE of the following	12M

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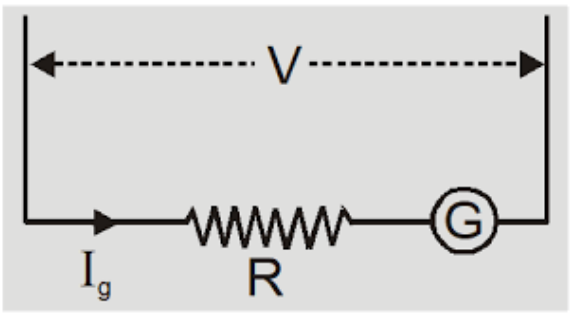
	a)	**Calculate the value of multiplier resistance on the 50V range of a dc voltmeter that uses a 200μA meter movement with an internal resistance of 100Ω.**	**4M**
	Ans.	$I_m=200\mu A,\ V=50V,\ R_m=100\Omega$ $V_m = I_m \times R_m$ $= 200 \times 10^{-6} \times 100$ $V_m = 0.02$ $\frac{V}{Vm} = 1 + \frac{Rs}{Rm}$ $\frac{50}{0.02}=1+\frac{Rs}{Rm}$ $2500=1+\frac{Rs}{Rm}$ $\frac{Rs}{Rm}=2499$ $Rs= 2499 \times 100$ $Rs=249.9k\Omega$	4M
	b)	**Sketch labeled Equivalent circuit diagram of practical ammeter and voltmeter.**	**4M**
	Ans	 **Voltmeter**	**Each sketch-2 M**

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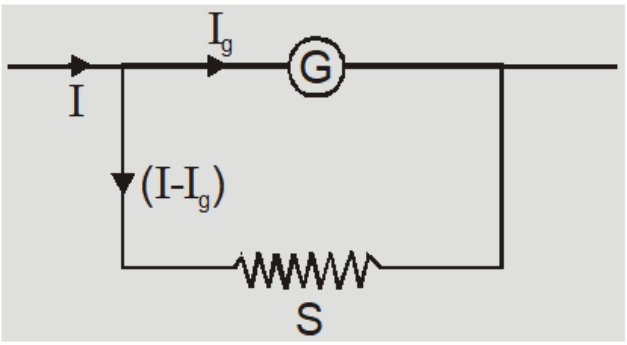
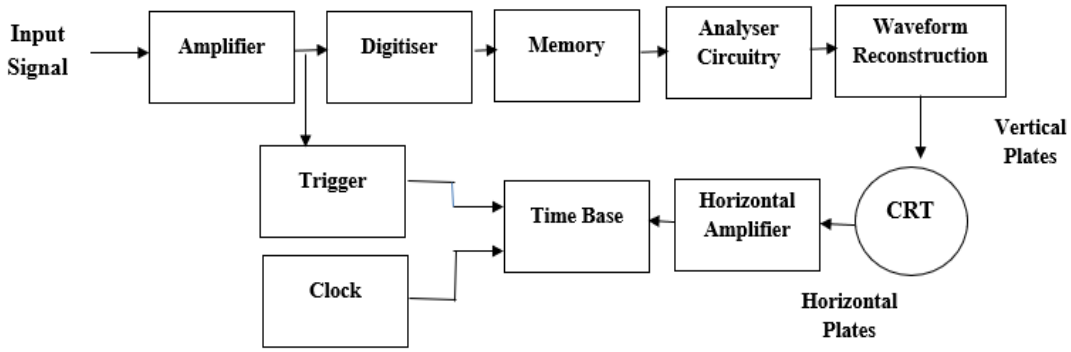


Ammeter

	c)	**Suggest instruments to measure unknown frequency above 5 MHz and store results. – Justify it.**	**4M**
	Ans	Name: Digital Storage Oscilloscope The block diagram of the digital storage oscilloscope consists of an amplifier, digitizer, memory, analyzer circuitry. Waveform reconstruction, vertical plates, horizontal plates, cathode ray tube (CRT), horizontal amplifier, time base circuitry, trigger, and clock. The block diagram of the digital storage oscilloscope is  A digital storage oscilloscope digitizes the analog input signal, then the analog input signal is amplified by amplifier if it has any weak signal. After amplification, the signal is digitized by the digitizer and that digitized signal stores in memory. The analyzer circuit process the digital signal after that the waveform is reconstructed (again the digital signal is converted into an analog form) and then that signal is applied to vertical plates of the cathode ray tube (CRT).	**Name-1M** **Diagram-2M** **Justification-1M**

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		The cathode ray tube has two inputs they are vertical input and horizontal input. The vertical input signal is the 'Y' axis and the horizontal input signal is the 'X' axis. The time base circuit is triggered by the trigger and clock input signal, so it is going to generate the time base signal which is a ramp signal. Then the ramp signal is amplified by the horizontal amplifier, and this horizontal amplifier will provide input to the horizontal plate. On the CRT screen, we will get the waveform of the input signal versus time. The digitizing occurs by taking a sample of the input waveform at periodic intervals. At the periodic time interval, when half of the time cycle is completed then we are taking the samples of the signal. The process of digitizing or sampling should follow the sampling theorem. The sampling theorem says that the rate at which the samples are taken should be greater than twice the highest frequency present in the input signal. When the analog signal is not properly converted into digital then there occurs an aliasing effect. When the analog signal is properly converted into digital then the resolution of the A/D converter will be decreased. When the input signals stored in analog store registers can be read out at a much slower rate by the A/D converter, then the digital output of the A/D converter is stored in the digital store, and it allows operation up to 100 mega samples per second. This is the working principle of a digital storage oscilloscope.	
	d)	**Describe with sketches and procedure to measure given unknown inductance value using Hay's Bridge.**	**4M**
	Ans.	The unknown inductor L1 is placed in the arm ab along with the resistance R1. This unknown inductor is compared with the standard capacitor C4 connected across the arm cd. The resistance R4 is connected in series with the capacitor C4. The other two non-inductive resistors R2 and R3 are connected in the arm ad and bc respectively.	**Description-2 M** **Sketch-1 M**

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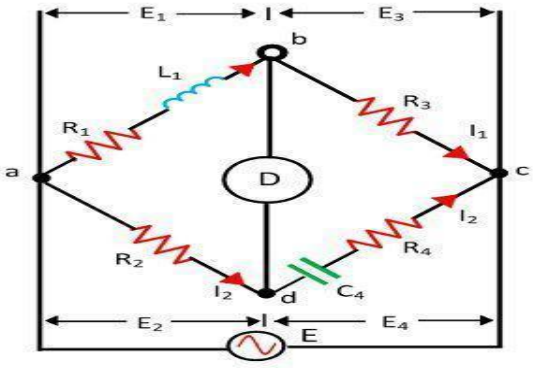

The C4 and R4 are adjusted for making the bridge in the balanced condition. When the bridge is in a balanced condition, no current flows through the detector which is connected to point b and c respectively. The potential drops across the arm ad and cd are equal and similarly, the potential across the arm ab and bc are equal.

Let,

L1 – unknown inductance having a resistance R1

R2, R3, R4 – known non-inductive resistance.

$$(R_1 + j\omega L_1)(R_4 - j/\omega C_4) = R_2R_3$$

At balance condition,

$$R_1R_4 + \frac{L_1}{C_4} + j\omega L_1R_4 - \frac{jR_1}{\omega C_4} = R_2R_3$$

Separating the real and imaginary term, we obtain

$$R_1R_4 + \frac{L_1}{C_4} = R_2R_3 \quad and\ L_1 = \frac{-R_1}{\omega^2 R_4C_4}$$

$$L_1 = \frac{R_2R_3C_4}{1 + \omega^2R_4^2C_4^2}$$

$$R_1 = \frac{\omega^2C_4^2R_2R_3R_4}{1 + \omega^2R_4^2C_4^2}$$

Solving the above equation

The equation of the unknown inductance and capacitance consists of frequency terms. Thus for finding the value of unknown inductance the frequency of the supply must be known.

Equation- 1 M

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	Ans	The unknown inductor L1 is placed initial. Let, L1 – unknown inductance having a resistance R1 R2, R3, R4 – known non-inductive resistance. C4 – standard capacitor $(R_1 + j\omega L_1)(R_4 - j/\omega C_4) = R_2R_3$ At balance condition, $R_1R_4 + \frac{L_1}{C_4} + j\omega L_1R_4 - \frac{jR_1}{\omega C_4} = R_2R_3$ Separating the real and imaginary term, we obtain $R_1R_4 + \frac{L_1}{C_4} = R_2R_3$ and $L_1 = \frac{-R_1}{\omega^2 R_4C_4}$ $L_1 = \frac{R_2R_3C_4}{1 + \omega^2R_4^2C_4^2}$ $R_1 = \frac{\omega^2C_4^2R_2R_3R_4}{1 + \omega^2R_4^2C_4^2}$ Solving the above equation The equation of the unknown inductance and capacitance consists of frequency terms. Thus for finding the value of unknown inductance the frequency of the supply must be known.	**Description-2 M** **Sketch-1 M** **Equation-1 M**
Q.5		**Attempt any TWO of the following**	**12M**
	a)	**Draw the block diagram of Digital Voltmeter, explain the function of each Block. (Ramp type Voltmeter)**	**6M**
	Ans	This is given to an input comparator which will compare two signals and generate the output. One input to the input comparator is from the input and another input is from the ramp. This input voltage and ramp signal are compared and output is given. If the ramp signal is more than input voltage there will be no output but if the input voltage is greater than the ramp signal then a is generated which will open the gate. Now when the gate gets opened, clock will send clock pulses which are counted by the counter and displayed on the screen. The comparator will compare the ramp signal and ground and output is given. This output will stop the flow of purchase from clock.	**3M Diagram & 3M Explanation**

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		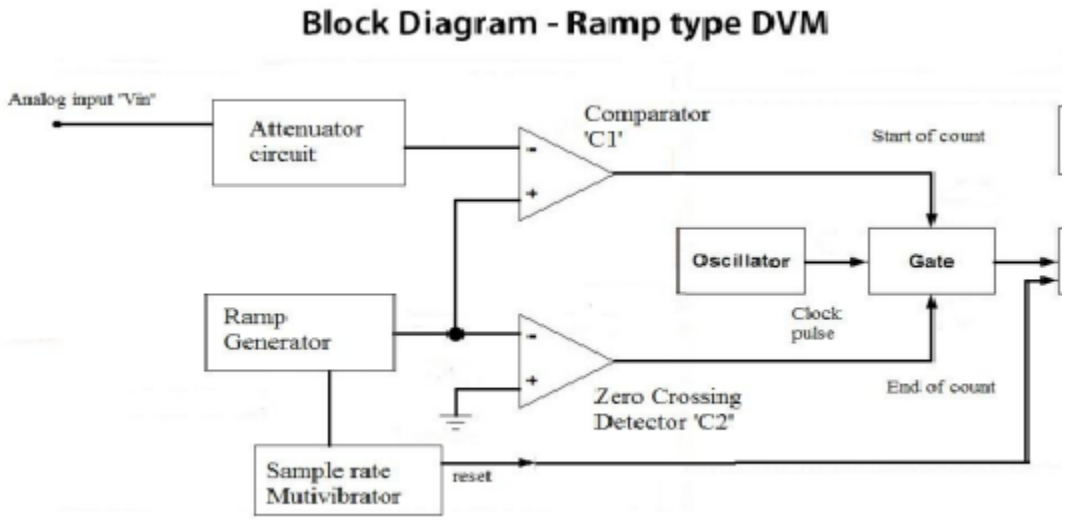	
	b)	**Explain logic Analyser with block diagram.**	**6M**
	Ans	A logic analyzer can be triggered on a complicated sequence of digital events, then capture a large amount of digital data from the system under test (SUT).When logic analysers first came into use, it was common to attach several hundred "clips" to a digital system. Later, specialized connectors came into use. Once the probes are connected, the user programs the analyzer with the names of each signal, and can group several signals together for easier manipulation. Next, a capture mode is chosen, either "timing" mode, where the input signals are sampled at regular intervals based on an internal or external clock source, or "state" mode, where one or more of the signals are defined as "clocks", and data are taken on the rising or falling edges of these clocks, optionally using other signals to qualify these clocks. After the mode is chosen, a trigger condition must be set. A trigger condition can range from simple to very complex At this point, the user sets the analyzer to "run" mode, either triggering once, or repeatedly triggering. Once the data are captured, they can be displayed several ways, from the simple) to the complex.	3M Diagram and 3M Explanation

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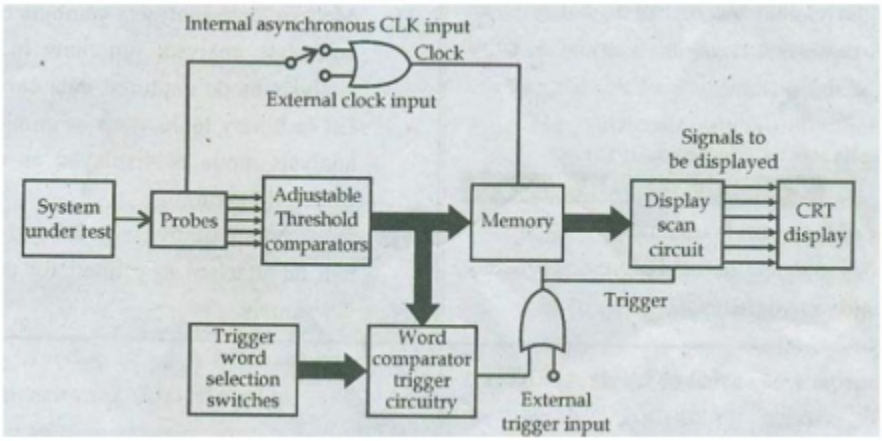
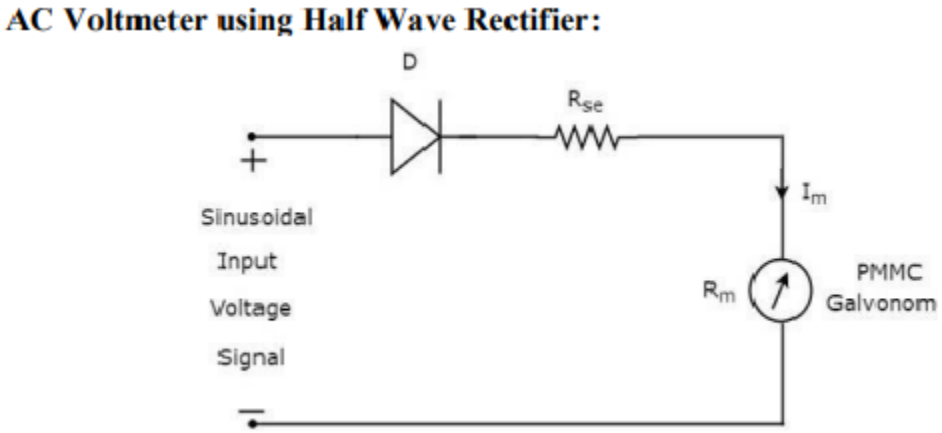
			
	c)	**Draw the block diagram of AC Voltmeter, explain working of half wave AC Voltmeter.**	**6M**
	Ans	**Figure of AC Voltmeter using Half Wave Rectifier:**  If a Half wave rectifier is connected ahead of a DC voltmeter, then that entire combination together is called AC voltmeter using Half wave rectifier. The block diagram of the AC voltmeter using the Half wave rectifier is shown in below figure. The above block diagram consists of two blocks: half wave rectifier and DC voltmeter. We will get the corresponding circuit diagram, just by replacing each block with the respective component(s) in the above block diagram. So, the circuit diagram of the AC voltmeter using the Half wave rectifier will look like as shown in the figure below. The rms value of sinusoidal (AC) input voltage signal is	**2M Diagram and 4M Explanation**

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		$V_{rms}=V_{m2}-\sqrt{V_{rms}}=V_{m2}$ $\Rightarrow V_m=2-\sqrt{V_{rms}}\Rightarrow V_m=2V_{rms}$ $\Rightarrow V_m=1.414V_{rms}\Rightarrow V_m=1.414V_{rms}$ Where, VmVm is the maximum value of sinusoidal (AC) input voltage signal. The DC or average value of the Half wave rectifier's output signal is $V_{dc}=V_m\pi V_{dc}=V_m\pi$ Substitute, the value of VmVm in above equation. $V_{dc}=1.414V_{rms}\pi V_{dc}=1.414V_{rms}\pi$ $V_{dc}=0.45V_{rms}V_{dc}=0.45V_{rms}$ Therefore, the AC voltmeter produces an output voltage, which is equal to 0.4 the rms value of the sinusoidal (AC) input voltage signal	
Q.6		**Attempt Any TWO of the following:**	**12M**
	a)	**Draw the block diagram of DSO. Explain the function of each block.**	**6M**
	Ans	The input is amplified and attenuated with input amplifiers. The output of the input signal amplifiers feeds an analog to digital converter (ADC). There are numbers of ADC available. But the selection of ADC depends on the speed of converters, because the conversion of analog to digital signal should be at a fast rate. A digital storage oscilloscope digitizes the input signal, so that all subsequent signals are digital. The storage occurs in electronic digital memory. The input signal is digitized and stored in memory in digital form. In this state it is capable of being analyzed to produce a variety of different information. To view the display on the CRT, the data from memory is reconstructed in analog form.	3M Diagram and 3M Explanation

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		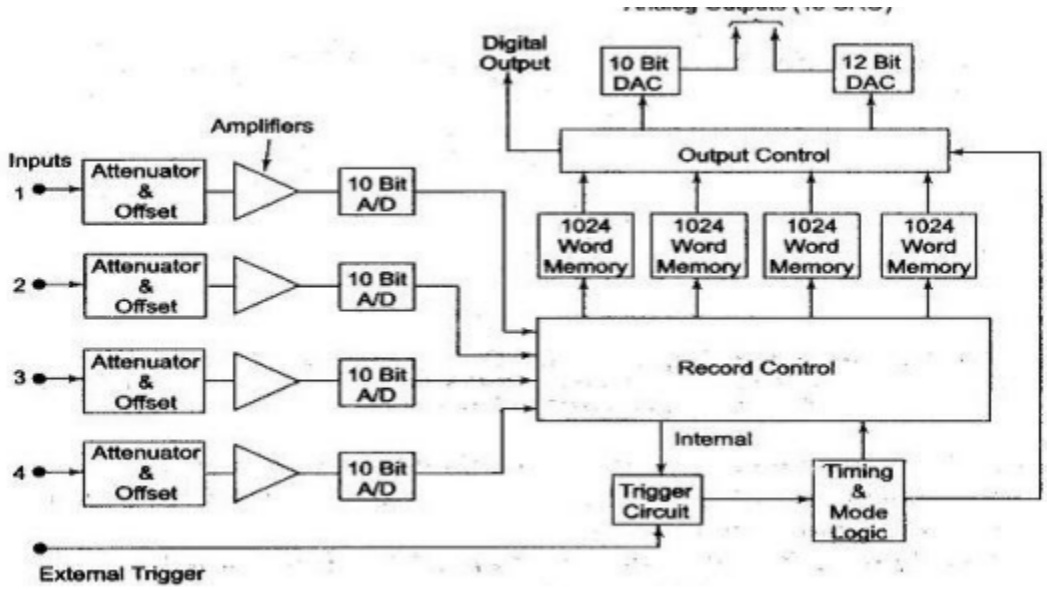	
	b)	**Define Calibration of the meter. Explain calibration method of the Analog Voltmeter.**	**6M**
	Ans	**Definition of Calibration of the meter** Meter Calibration means the act of checking or adjusting (by comparison with a standard) the accuracy of a meter. **Calibration of Voltmeter:** The calibration is the process of checking the accuracy of the result by comparing it with the standard value. In other words, calibration checks the correctness of the instrument by comparing it with the reference standard. It helps us in determining the error occurring in the reading and adjusts the voltages for getting the ideal reading. The circuit for the calibration of the voltmeter is shown in the figure below.The circuit requires two rheostats, one for controlling the voltage and another for adjustment. The voltage ratio box is used to step-down the voltage to a suitable value. The accurate value of the voltmeter is determined by measuring the value of the voltage to the maximum possible range of the potentiometer.The potentiometer measures the maximum possible value of voltages. The negative and positive error occurs in the readings of the voltmeter if the readings of the potentiometer and the voltmeter are not equal.	**1M Definition** **3M Diagram and 2M Explanation**

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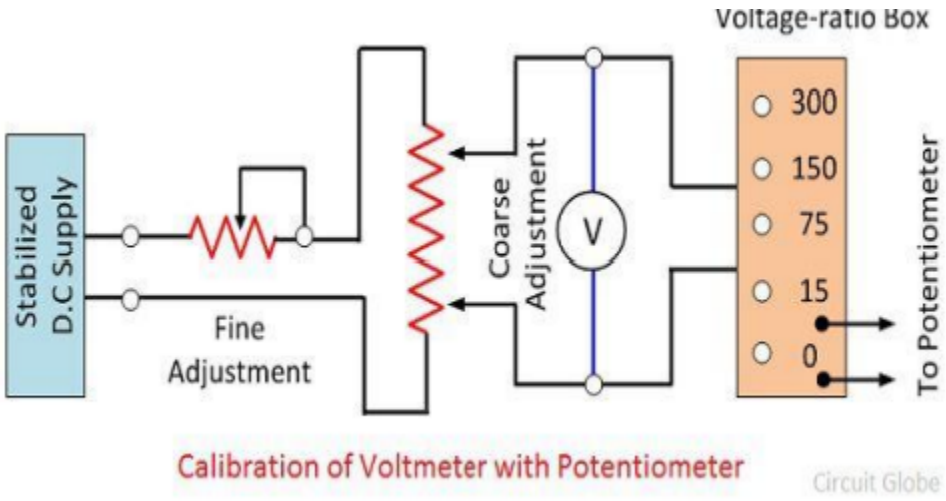
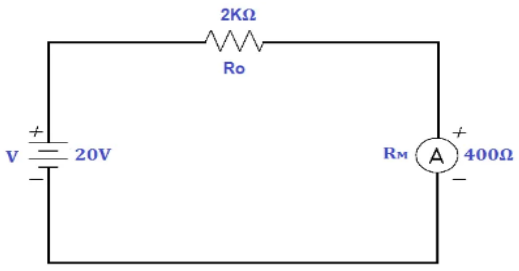


	c)	**Define the accuracy. Explain a method to test the accuracy of a given Ammeter.**	**6M**
	Ans	Accuracy is the ability of the instrument to measure the accurate value. In other words, it is the closeness of the measured value to a standard or true value **Method to test the accuracy of given Ammeter** Consider An ammeter, with a 10 mA full scale deflection and an internal resistance of 400 Ω, is placed in a circuit with a 20 V power source and a 2KΩ resistor.  Figure 2 : Ammeter Accuracy Find accuracy Solution: $K_A = R / (Ro + Rm)$ $K_A = 2000/(2000 + 2000)$ $K_A = 0.833$ or 83.3% **Note:OR** any other relevant answer can be considered.	**2M Definition & 4M Method**