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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**

Course Code: 23EE3PCMNI **Max Marks: 100**

Course: Measurements and Instrumentation

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	With a neat circuit diagram arrive at the balance condition of kelvin's double bridge.	*CO2*	*PO2*	**08**
	b)	A Wheatstone bridge has the following has the following resistances: P= 1kΩ, R=1 kΩ, S=5kΩ, Galvanometer resistance G=100Ω. The thevenin's source generator voltage E_o = 24mV and the galvanometer current is 13.6μA. Determine the value of Q.	*CO2*	*PO2*	**07**
	c)	Explain the Loss of Charge method for high resistance measurement.	*CO2*	*PO1*	**05**
		OR			
2	a)	Explain the terms Absolute instruments and Secondary instruments w.r.t measuring systems.	*CO1*	*PO1*	**04**
	b)	Define the term standardization and explain the steps used for measurement using Crompton's type dc potentiometer with the circuit diagram	*CO2*	*PO1*	**10**
	c)	Derive the expression for the current through the galvanometer and bridge sensitivity S_B in case of unbalanced Wheatstone bridge.	*CO2*	*PO2*	**06**
		UNIT - II			
3	a)	Derive the equations for balance in case of modified desauty's bridge. Draw the phasor diagram for balance condition.	*CO2*	*PO2*	**06**
	b)	The four arms of the bridge are Arm AB: an imperfect capacitor C1 with equivalent resistance r1. Arm BC: a non-inductive resistor R3= 400Ω. Arm CD: a non-inductive resistor R4=5700Ω	*CO2*	*PO2*	**06**

			Arm DA: an imperfect capacitor C2 = 0.5μF with equivalent resistance r2=0.4Ω in series with resistor R2=4.6Ω. A source of frequency 480 Hz is given to the terminals A & C and a detector is connected between B & D Determine C1, r1, loss angle and the dissipation factor of the capacitor.			
		c)	Derive the equations for balance in case of Anderson's bridge. Draw the phasor diagram for balance condition.	*CO2*	*PO2*	**08**
			OR			
	4	a)	Derive the equations for balance in case of Maxwell's Inductance capacitance bridge. Draw the phasor diagram for balance condition.	*CO2*	*PO2*	**07**
		b)	An AC bridge circuit working at 1000Hz consists of a pure capacitance of 0.2μF as arm ab, 500Ω pure resistance as arm bc, an unknown impedance as arm cd and a parallel combination of 300Ω resistance and 0.1μF capacitance as arm da. Determine the value of unknown impedance for balancing the bridge.	*CO2*	*PO2*	**07**
		c)	Discuss the sources and the detectors that are used for a.c. bridges.	*CO1*	*PO1*	**06**
			UNIT - III			
	5	a)	Draw the equivalent circuit and phasor diagram of a current transformer and derive the expression for ratio error.	*CO2*	*PO2*	**08**
		b)	A wattmeter has a current coil of resistance 0.03 ohm and a pressure coil of resistance 6000 ohms is connected to measure the power consumed by a load. Determine the percentage error if the wattmeter is so connected that: 1) the current coil is on the load side 2) the pressure coil is on the load side If the load takes 20A at a voltage of 220V and 0.6 power factor	*CO3*	*PO2*	**07**
		c)	Define the following w.r.t current transformer a. Actual ratio b. Turns ratio c. Nominal ratio d. Ratio correction Factor e. % Ratio error	*CO1*	*PO1*	**05**
			OR			
	6	a)	Justify with suitable derivations that a dynamometer type wattmeter can be used for DC as well as AC power measurements.	*CO2*	*PO2*	**07**
		b)	A 1000/5A ,50Hz current transformer has a secondary burden comprising a non-inductive impedance of 1.6Ω. The primary winding has one turn. Determine the flux in the core and ratio error at full load. Neglect leakage reactance and assume iron loss in the core to be 1.5W at full load. The magnetizing mmF is 100A.	*CO2*	*PO2*	**08**

		c)	With a neat diagram explain the operation of dynamometer type power factor meter.	*CO2*	*PO1*	**05**
			UNIT - IV			
	7	a)	With a neat diagram explain the working of Electronic Multimeter	*CO2*	*PO1*	**07**
		b)	With neat diagram explain the working principle of 3-bit ADC	*CO2*	*PO1*	**08**
		c)	A $4^{1/2}$ digit voltmeter is used for voltage measurements. i) Determine its resolution ii) How would 18.24 V be displayed on a 10V range iii) How would 0.9573 be displayed on 1V and 10V ranges.	*CO3*	*PO2*	**05**
			OR			
	8	a)	Enumerate the difference between digital instruments and analog instruments.	*CO1*	*PO1*	**05**
		b)	Explain the working of Linear Ramp type DVM using necessary block diagram.	*CO2*	*PO1*	**07**
		c)	With a neat block diagram explain the working of digital storage oscilloscope.	*CO2*	*PO1*	**08**
			UNIT - V			
	9	a)	Prove that gauge factor of strain gauge is given by $G_f = 1+2u$, where u is poisson's ratio.	*CO2*	*PO2*	**08**
		b)	Explain the operation of Hall effect Transducer.	*CO2*	*PO1*	**06**
		c)	Enumerate the working principle and types of a Thermocouple.	*CO2*	*PO1*	**06**
			OR			
	10	a)	Discuss the Classification of Transducers	*CO1*	*PO1*	**06**
		b)	With relevant figures explain the construction and working of LVDT	*CO2*	*PO1*	**08**
		c)	With a neat diagram explain the operation of Photovoltaic cell	*CO2*	*PO1*	**06**

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