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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: 22EE3PCEEM **Max Marks: 100**

Course: Electrical and Electronic Measurements

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)	Describe the sources and the null detectors that are used for a.c. bridges.	*CO1*	*PO1*	**06**
	b)	The arms of a five node bridge are as follows: Arm AB consists of an unknown impedance (R_1, L_1) in series with a non-inductive variable resistor r_1. Arm BC a non –inductive resistor R3 =100Ω, Arm CD: a non –inductive resistor R_4 =200Ω, Arm DA: a non-inductive resistor R_2=250Ω, Arm DE a non –inductive variable resistor r, Arm EC- a loss-less capacitor C=1μF, and Arm BE: a detector. An a.c supply is connected between a and c. Draw the bridge circuit and determine the values of R_1, L_1 when under balance conditions r_1 =43.1 Ω and r=229.7 Ω	*CO3*	*PO2*	**06**
	c)	With a neat circuit diagram arrive at the balance condition of kelvin's double bridge.	*CO2*	*PO2*	**08**
		OR			
2	a)	Derive the equations for balance in case of Hay's bridge. Draw the phasor diagram for balance condition.	*CO2*	*PO2*	**08**
	b)	A Wheatstone's bridge circuit arrangement is as follows: ratio arms: 100Ω and 10Ω, standard resistance 4Ω and the test resistance 50Ω. Determine the unbalanced current in the galvanometer of the internal resistance 20Ω, when the supply voltage is 10 volts. Also determine the value of unknown resistance corresponding to the null reading by galvanometer.	*CO3*	*PO2*	**08**
	c)	Enumerate the limitations of Wheatstone bridge.	*CO2*	*PO1*	**04**

			UNIT - II			
	3	a)	With the help of a block diagram explain the operation of electronic energy meter.	*CO2*	*PO1*	**07**
		b)	A wattmeter has a current coil of resistance 0.03Ω and a pressure coil of resistance 6000Ω is connected to measure the power consumed by a load. Determine the percentage error in the reading of the wattmeter when the load takes 20 A at 220 V with 0.6 power factor, when (i)the pressure coil is connected on the load side and (ii) When the current coil is connected on the load side.	*CO3*	*PO2*	**07**
		c)	With the help of a neat diagram explain the working of dynamometer type wattmeter.	*CO2*	*PO1*	**06**
			OR			
	4	a)	Explain the special features incorporated in Low power factor wattmeter.	*CO2*	*PO1*	**07**
		b)	A wattmeter has a current coil of 0.1Ω resistance and a pressure coil of 6500Ω resistance. Determine the percentage errors, due to resistance only, when reading the input to an apparatus which takes a) 12A at 250V with unity power factor b) 12A at 250V and 0.4 power factor	*CO2*	*PO2*	**06**
		c)	With the help of a neat diagram explain the working of single-phase power factor meter.	*CO2*	*PO1*	**07**
			UNIT - III			
	5	a)	A Current transformer with a bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.5Ω and 1.0Ω respectively including the transformer winding. With 5A flowing in the secondary winding, the magnetizing mmf is 100A and iron loss is 1.2W. Determine the ratio error.	*CO3*	*PO2*	**08**
		b)	Draw the equivalent circuit and phasor diagram of a current transformer and derive the expression for phase angle error.	*CO2*	*PO2*	**08**
		c)	Describe how a DC potentiometer can be used for measurement of power.	*CO2*	*PO1*	**04**
			OR			
	6	a)	Define the following terms as used for current transformers. a. Ratio correction Factor b. Nominal ratio	*CO1*	*PO1*	**04**
		b)	A 100/5A 50Hz current transformer has a bar primary and a rated secondary burden of 12.5VA. The secondary winding has 196 turns and a leakage inductance of 0.96 mH. With a purely resistive	*CO3*	*PO2*	**08**

			burden at rated full load, the magnetization mmf is 16 A and the loss excitation requires 12A. Determine the ratio and phase angle errors.			
		c)	Explain the term "Standardization" of a potentiometer. Also explain the operation of Crompton's DC Potentiometer.	*CO2*	*PO1*	**08**
			UNIT - IV			
	7	a)	With a neat block diagram explain the working of a Digital multimeter.	*CO2*	*PO1*	**07**
		b)	A $4^{1/2}$ digit voltmeter is used for voltage measurements. i) Determine its resolution ii) How would 12.98 V be displayed on a 10V range How would 0.6973 be displayed on 1V and 10V ranges.	*CO3*	*PO2*	**05**
		c)	With a neat block diagram explain the working of digital storage oscilloscope.	*CO2*	*PO1*	**08**
			OR			
	8	a)	Explain the advantages of digital instruments over analog instruments	*CO2*	*PO1*	**06**
		b)	With a neat block diagram explain the working of Ramp type DVM	*CO2*	*PO1*	**07**
		c)	Explain the operation of LCR Meter.	*CO2*	*PO1*	**07**
			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)	With necessary diagram explain the construction and working of LVDT	*CO2*	*PO1*	**07**
		c)	Explain the working principle of a Thermocouple	*CO2*	*PO1*	**05**
			OR			
	10	a)	What are transducers? Discuss the classification of transducers	*CO2*	*PO1*	**07**
		b)	With a neat diagram explain the operation of Hall Effect transducer.	*CO2*	*PO1*	**07**
		c)	Explain the construction and working of Piezo Electric transducer.	*CO2*	*PO1*	**06**

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