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

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Electrical & Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE3PCEEM **Max Marks: 100**
Course: Electrical & Electronic Measurements **Date: 19.05.2023**

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

UNIT - I

1 a) With the help of circuit diagram and phasor diagram, derive the bridge balance condition for the measurement of resistance, inductance and quality factor of a coil using Hay's bridge. **08**

b) Draw the circuit of a Kelvin's Double bridge used for measurement of low resistances. Derive the condition for balance. **06**

c) A Sheet of bakelite 4.5mm thick is tested at 50Hz between electrodes 0.12m in diameter. The Schering bridge employs a standard air capacitor C_2 of 106 pF capacitance, a non-reactive resistance R_4 of $1000/\pi\ \Omega$ in parallel with a variable capacitor C_4 = 0.5μF and a non-reactive variable resistance R_3. Balance is obtained with R_3 =260Ω..Compute the capacitance, loss factor and power factor of the capacitor **06**

OR

2 a) With the help of circuit diagram and phasor diagram, derive the bridge balance condition for the measurement of resistance, capacitance, loss factor of a capacitor using Schering bridge circuit. **08**

b) Derive the expression for bridge sensitivity of a wheatstone bridge network with unequal ratio arms. **06**

c) A Maxwell- Wien bridge is used to measure an unknown inductance in comparison with capacitance. The various values at balance are R_2=40Ω; R_3=60Ω; R_4=1000Ω; C_4=0.5μF. Calculate the values of R_1 and L_1 and also the value of storage factor (Q) of coil, if frequency is 1000Hz. **06**

UNIT - II

3 a) With the help of neat diagram and phasor diagrams, explain the construction and operation of single phase dynamometer type power factor meter. **07**

b) With the help of neat diagram, explain the working of dynamometer type wattmeter. **06**

c) An electrodynamic wattmeter is used to measure the power in a 1Ø load. The load voltage is 200V and the load current is 10A at a lagging power factor of 0.8.The wattmeter voltage circuit has a resistance of 10000Ω & inductance 0.1H and it is connected directly across the load. Estimate the error in the wattmeter reading at 50 Hz frequency. **07**

UNIT - III

4	a)	With the help of equivalent circuit and phasor diagram, derive the expression for ratio error and phase angle of a current transformer.	**08**
	b)	Explain the method of turns compensation used in current transformers to eliminate the ratio error.	**06**
	c)	A dc potentiometer has a 6step dial switch where each step represents 0.25V.The dial resistors are 25Ω each. The slide wire of the potentiometer is circular and has resistance of 25Ω. The slide wire has 250 divisions and interpolation can be done to one-fifth of a division. The working battery has a voltage of 2V with negligible internal resistance. Compute (i) the measuring range of the potentiometer (ii) working current (iii) Resolution (iv) Setting of rheostat.	**06**

OR

5	a)	With the help of circuit diagram, explain the standardization procedure and how unknown resistance is measured using Crompton dc potentiometer.	**08**
	b)	With the help of circuit diagram, explain how load power is measured using dc potentiometer.	**06**
	c)	The no load current of a ring core current transformer of nominal ratio 1000/5A, when operating at full primary current and with a secondary burden of non-inductive resistance of 1Ω is 1A at a power factor of 0.4. Calculate (i) the phase angle of current transformer (ii) the ratio error at full load, assuming that there has been no compensation.	**06**

UNIT - IV

6	a)	With the help of a neat block diagram, explain the operation of digital multimeter.	**07**
	b)	With the help of a neat block diagram, explain the working of digital storage oscilloscope. Mention its four specific advantages.	**08**
	c)	List the advantages of digital voltmeters over conventional analog voltmeters.	**05**

UNIT - V

7	a)	With the help of neat diagram, explain working of Hall effect transducer.	**08**
	b)	Differentiate between thermistor and resistance temperature detector.	**06**
	c)	With the help of neat sketch, explain the operation of piezoelectric transducer.	**06**

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