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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 and Electronics Engineering **Duration: 3 hrs.**
Course Code: 19EE3PCEEM **Max Marks: 100**
Course: Electrical and 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.

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.

R.M.S.C.E. - ODD SEM 2022-23

UNIT - I

1. 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 resistor of 50μΩ was measured by Kelvin's double bridge having following component resistors. Standard resistance: 100.03μΩ , Inner ratio arms:100.31Ω and 200Ω Outer ratio arms: 100.24Ω and 200Ω, connecting resistance between four terminal resistor is 700μΩ. Calculate the unknown resistance. **06**

OR

2. 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 Maxwell Wien bridge. **08**

   b) List the errors in ac bridges and method of minimizing the ac bridge errors. **06**

   c) A sheet of bakelite is tested at 50 Hz between the circular electrodes. The Schering bridge employs a standard air capacitor C4 ,a non reactive resistance R 3 of(1000/π) Ω in parallel with a capacitor C3=0.5μF and a nonreactive variable resistance of R3. Balance is obtained when R2=260Ω.Compute the loss factor, power factor and quality factor of the bakelite sheet. **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. **07**

   b) With the help of block diagram, explain the working of Electronic energy meter. **06**

   c) An electrodynamic wattmeter is used to measure the power in a 1Ø load. The load voltage is 230V and the load current is 10A at a lagging power factor of 0.1.The wattmeter voltage circuit has a resistance of 10000Ω & **07**

inductance 0.1H and it is connected directly across the load. Estimate the error in the wattmeter reading at 50 Hz frequency.

UNIT - III

4. a) With the help of equivalent circuit and phasor diagram, derive the expression for ratio error phase angle of a current transformer. **09**

   b) Explain the method of turns compensation used in current transformers to reduce ratio error. **05**

   c) A dc potentiometer has a 15 step dial switch where each step represents 0.1V.The dial resistors are 10Ω each. The slide wire of the potentiometer is circular and has resistance of 10Ω. The slide wire has 100 divisions and interpolation can be done to one-fourth 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. **07**

   b) With the help of circuit diagram, explain how load power is measured using dc potentiometer. **06**

   c) A 100/5A current transformer at its rated burden of 20VA has an core loss of 0.18W and a magnetizing current of 1.4A. It is supplying rated output to a meter having a ratio of reactance to resistance of 0.25. Compute the ratio error and phase angle of current transformer. **07**

UNIT - IV

6. a) With the help of a neat block diagram and timing diagram, explain the operation of digital voltmeter is working on voltage to time conversion principle. **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) Explain the construction and working of linear variable differential transformer with neat diagram. Sketch the output voltage versus core displacement characteristic. **08**

   b) A Strain gauge is bonded to a beam 10cm long and has a cross sectional area of 2 cm2. The modulus of elasticity of steel is 200GN/m2. The strain gauge has a unstrained resistance of 200Ω and a gauge factor of 2.When load is applied, the resistance of gauge changes by 0.2Ω,Calculate the change in length of the beam and the amount of force applied to the beam. **06**

   c) Differentiate between thermistor and resistance temperature detector. **06**

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