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GIET UNIVERSITY, GUNUPUR - 765022

B. Tech (Third Semester Regular) Examinations, December - 2023 22BECPC23002 - Electrical and Electronic Measurements (ECE)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks)
PART - A**(2 x 5 = 10 Marks)**Q.1. Answer **ALL** questions

| | CO # | Blooms Level |
|---|------|-----------------|
| a. What were the drawbacks of Kelvin's bridge due to which Kelvin's double bridge was designed? | CO1 | K3 |
| b. A Maxwell bridge is used to measure an inductive impedance. The bridge constants at balance conditions are: $R_1 = 235 \text{ k}\Omega$, $C_1 = 0.012 \text{ }\mu\text{F}$, $R_2 = 2.5 \text{ k}\Omega$, $R_3 = 50 \text{ k}\Omega$. Find the series equivalent of the unknown impedance. | CO1 | K3 |
| c. Define the following terms used in galvanometer (i) CDRX (ii) logarithmic decrement. | CO2 | K1 |
| d. How is dynamometer type instrument used as an ammeter for measurements of small currents? | CO1 | K4 |
| e. If the core of CT is permanently magnetized then how will you demagnetize it? | CO2 | K5 |

PART - B**(15 x 4 = 60 Marks)**Answer ALL questions

| | Marks | CO # | Blooms Level |
|---|-------|------|-----------------|
| 2. a. In a four-arm bridge network, the arm AB of an imperfect condenser consists of an unknown capacitor in series with unknown resistance, BC and CD are non-reactive resistances of $1000 \text{ }\Omega$ each and DA is a standard capacitor of $0.0115 \text{ }\mu\text{F}$ capacitance in series with a resistance of $140 \text{ }\Omega$. If the bridge is balanced for frequency $\omega = 7500$ radians/sec, Find the shuntless unknown resistance and capacitance of the imperfect condenser. | 8 | CO3 | K3 |
| b. Draw a neat diagram of the Anderson Bridge. Deduce the equations when the bridge is under balance condition. | 7 | CO1 | K2 |
| (OR) | | | |
| c. A length of cable is tested for insulation resistance by the loss of charge method. An electrostatic voltmeter of infinite resistance is connected between the cable conductor and earth, forming therewith a joint capacitance of 600 pF ($600 \times 10^{-12} \text{ F}$). It is observed that after charging the voltage falls from 250 V to 92 V in 1 min . Calculate the insulation resistance of the cable. | 8 | CO2 | K3 |
| d. Describe the working of Maxwell's inductance-capacitance bridge for measurement of inductance with a suitable diagram. | 7 | CO1 | K2 |
| 3.a. What is the basic principle of potentiometer? Briefly explain the applications of potentiometer. | 7 | CO2 | K2 |

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|------|---|---|-----|----|
| b. | The suspended coil of a galvanometer has a 5 mm x 2.5 mm mean area and is situated in a magnetic field of 1.1 tesla. The moment of inertia of moving parts is 0.25×10^{-6} kg-m and the control string constant is 35×10^{-6} Nm/rad. If a current of 12 mA produces a deflection of 110° , calculate the number of turns of the suspended coil. | 8 | CO2 | K2 |
| (OR) | | | | |
| c. | A mill ammeter of 2.5Ω resistance reads up to 100 mA. Calculate the resistance necessary to enable it to be used as; (i) A voltmeter reading up to 10 V (ii) An ammeter reading up to 10 A Draw the connection diagram of each case. | 7 | CO2 | K2 |
| d. | Prove that the deflection is proportional to square of the r.m.s value of the operating current in moving iron instruments. | 8 | CO2 | K2 |
| 4.a. | Three loads, each of resistance 30, are connected in star to a 415 V, 3-phase supply. Determine (i) the system phase voltage (ii) the phase current and (iii) the line current. | 7 | CO2 | K3 |
| b. | In a 3-phase circuit, two watt meters used to measure power indicate 1200 W and 600 W respectively. Find the power factor of the circuit: (i) When both wattmeter readings are positive. (ii) When the latter is obtained by reversing the current coil connections. | 8 | CO3 | K1 |
| (OR) | | | | |
| c. | Explain the working of a frequency meter which depends on electrical resonance. | 7 | CO2 | K3 |
| d. | While performing a load test on a 3-phase wound rotor induction motor by two watt meters, the readings obtained on two watt meters were 14.2 kW and -6.1 kW and the line voltage was 440 V. Calculate; (i) True power drawn by the motor (ii) Power factor (iii) Line current | 8 | CO3 | K1 |
| 5.a. | Write a short note on: (i) Wave analyser (ii) Harmonic distortion Analyser | 7 | CO2 | K2 |
| b. | A 1000/5 A, 50 Hz CT has a secondary load burden comprising of non-inductive impedance of 1.6 ohm. The primary winding has 1 turn, iron loss is 1.5W, mmf = 100AT. Calculate the flux in the core and the ratio error. | 8 | CO3 | K1 |
| (OR) | | | | |
| c. | With a circuit and phasor diagram of CT, derive the expression of actual transformation ratio, ratio error and phase angle. | 7 | CO2 | K2 |
| d. | Explain briefly Fundamental-suppression distortion Analyser. | 8 | CO3 | K1 |

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