

# CBCS SCHEME

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18EE36

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Electrical and Electronic Measurements

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- Explain the principle of operation of Kelvin's double bridge. Also mention its applications. (06 Marks)
  - A high sensitive galvanometer can detect a current as low as  $0.1\text{nA}$ . This galvanometer is used in a Wheatstone's bridge as a detector. Each arm of the bridge has a resistance of  $1\text{k}\Omega$ . The input voltage applied to the bridge is  $20\text{V}$ . Calculate the small change in resistance which can be detected. The resistance of the galvanometer can be neglected as compared with the internal resistance of the bridge. (06 Marks)
  - Mention the factors on which earth resistance depends. Explain the fall of potential method used for the measurement of earth resistance. (08 Marks)

OR

- A Maxwell's Inductance comparison bridge is as shown in Fig Q2(a). Arm ab consists of a coil with inductance  $L_1$  and resistance  $r_1$  in series with a non inductive  $R_1$ . Arm bc and cd are each a non-inductive resistance of  $100\Omega$ . Arm ad consists of standard variable inductor  $L$  of resistance  $32.7\Omega$ . Balance is obtained when  $L = 47.8\text{mH}$  and  $R = 1.36\Omega$ . Find the Resistance and inductance of coil in arm ab.

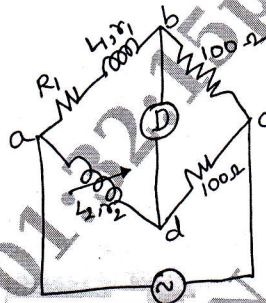


Fig Q2(a)

(06 Marks)

- The four arms of a bridge are :  
Arm ab : an imperfect capacitor  $C_1$  with an equivalent series resistance of  $r_1$  ;  
Arm bc : an non-inductive resistance  $R_3$  ;  
Arm da : an imperfect capacitor  $C_2$  with an equivalent resistance of  $r_2$  in series with a resistance  $R_2$ .  
A supply of  $450\text{Hz}$  is given between terminal a and c, and  $R_2 = 4.8\Omega$ ,  $R_3 = 2000\Omega$ ,  $R_4 = 2850\Omega$  and  $C_2 = 0.5\mu\text{f}$  and  $r_2 = 0.4\Omega$ . The detector is connected between b and d. Calculate the value of  $C_1$  and  $r_1$  and also of the dissipating factor for this capacitor. (08 Marks)
- With neat circuit diagram, explain the operation of modified Desautys bridge. Derive balanced equation and also draw phasor diagram under balanced condition. (06 Marks)

### Module-2

- Derive the torque equation of single phase Electro dynamometer type wattmeter. (06 Marks)
  - What is phase sequence indicator? Explain static type with relevant circuit diagram. (06 Marks)
  - In a particular test the two wattmeter readings are  $4\text{kW}$  and  $1\text{kW}$ . Calculate the power and power factor if i) Both meters read direct ii) One meter connections reversed. (04 Marks)

- d. What are creeping errors in an energymeter? What are its possible causes? How can it be compensated in an induction type energy meter? (04 Marks)

OR

- 4 a. With a neat sketch, explain the construction and working of Weston frequency meter. (08 Marks)
- b. A single phase energymeter has a constant of 1500 revolutions/kwh. If 8 lamps of 100w, 6 fans of 60w and 2 heaters of 1000w operate for one hour, the disc makes 4500 revolutions. Find out whether the meter reads correctly. If not find the percentage error. (06 Marks)
- c. Discuss the construction and working principle of electro-dynamometer type single phase power factor meter. (06 Marks)

**Module-3**

- 5 a. What is multiplier resistor? How it is used to extend the range of a voltmeter? Discuss about different way of designing multi-range voltmeter. (08 Marks)
- b. A 1mA meter D'Arsonval movement with an internal resistance of  $100\Omega$  is to be converted into 0-100mA ammeter. Calculate shunt Resistance required. What will be the range of the ammeter if shunt resistance is doubled? (06 Marks)
- c. Draw the equivalent circuit and vector diagram of a current transformer and hence write the expression for its ratio and phase angle error. (06 Marks)

OR

- 6 a. With a neat circuit diagram, explain measurement of magnetizing force using a search coil and a ballistic galvanometer. (07 Marks)
- b. Explain the Silsbee's method of testing current transformer. (07 Marks)
- c. What is turns compensation in instrument transformer? Why is it needed? (06 Marks)

**Module-4**

- 7 a. List out the advantages of electronic instruments over conventional analog meters. (06 Marks)
- b. With the help of block diagram, explain true RMS reading voltmeter. (08 Marks)
- c. With neat block diagram, explain the principle of working of electronic energy meter. (06 Marks)

OR

- 8 a. What are the operating and performance characteristics of a digital voltmeter? Explain integrating type digital voltmeter with a neat block diagram. (10 Marks)
- b. Explain the working of Q-meter. Also explain the errors in the measurement of Q-factor of coil. (10 Marks)

**Module-5**

- 9 a. With suitable diagram, explain the construction and working of strip chart recorders. (08 Marks)
- b. With a neat diagram, explain the operating principle of Electro Cardio Graph (ECG). (06 Marks)
- c. What are important characteristics of Nixie tube display systems? Explain with necessary diagrams. (06 Marks)

OR

- 10 a. Explain why recorders are essential? With neat block diagram, explain XY-recorders. (06 Marks)
- b. With necessary circuit diagrams, explain the basic operating principle of Light Emitting Diode (LED). List the advantages and disadvantages of LED display systems. (07 Marks)
- c. With a neat schematic diagram, explain the construction and operation of Cathode-Ray Tube. (07 Marks)

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