

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

1.
 - a. Explain the principle of operation of Kelvin's double bridge. Also mention its applications. (06 Marks)
 - b. A high sensitive galvanometer can detect a current as low as 0.1nA. This galvanometer is used in a Whetstone's bridge as a detector. Each arm of the bridge has a resistance of 1kΩ. The input voltage applied to the bridge is 20V. 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)
 - c. Mention the factors on which earth resistance depends. Explain the fall of potential method used for the measurement of earth resistance. (08 Marks)

OR

2.
 - a. 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 100Ω. Arm ad consists of standard variable inductor L of resistance 32.7Ω. Balance is obtained when $L = 47.8\text{mH}$ and $R = 1.36\Omega$. Find the Resistance and inductance of coil in arm ab.

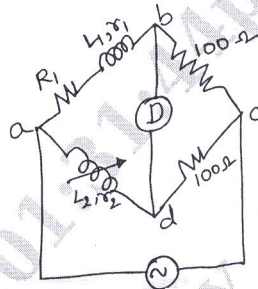


Fig Q2(a)

(06 Marks)

- b. 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 450Hz 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)
- c. 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

3.
 - a. Derive the torque equation of single phase Electro dynamometer type wattmeter. (06 Marks)
 - b. What is phase sequence indicator? Explain static type with relevant circuit diagram. (06 Marks)
 - c. In a particular test the two wattmeter readings are 4kW and 1kW. Calculate the power and power factor if i) Both meters read direct ii) One meter connections reversed. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- 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 100Ω 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)
