National Institute of Technology Hamirpur
Department of Electrical Engineering
B. Tech. (3rd Sem.) Electrical Engineering
End Semester Theory Examination (*December 2020*)

EE-213 *Subject: Electrical and Electronic Measurements*
Time: 2 hrs *Maximum Marks 50*

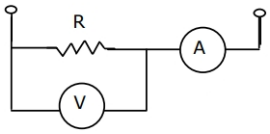
Instructions:

Each student is required to write his/her **Name, Roll No, Subject Name and Subject Code on top of first sheet** and put **Signature with Date at the bottom of each sheet** of the answer booklet.

After the examination time is over, the students may be given extra 10 minutes to scan and upload their answer booklets on Google Classroom or send back on subject teacher's Email Id. Further, delay in submission by a student may lead to deduction in marks or rejection of whole answer booklet.

Write steps and formula used in the calculation

Q.1 **(a)** The set-up in the figure is used to measure resistance R. The ammeter and voltmeter resistances are 0.01Ω and 2000Ω, respectively. Their readings are 2A and 180V, respectively, giving a measured resistance of 90Ω. Find the percentage error in the measurement.

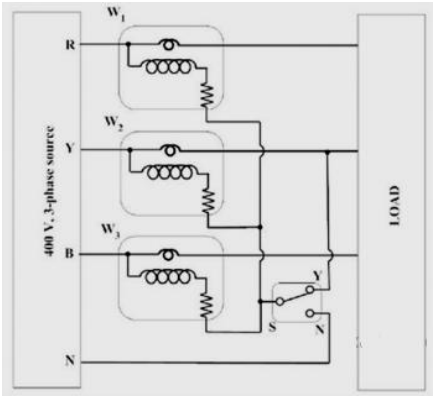


(b) Two ammeters X and Y have resistances of 1.2Ω and 1.5 Ω respectively and they give full-scale deflection with 150 mA and 250 mA respectively. The ranges have been extended by connecting shunts so as to give full scale deflection with 15 A. The ammeters along with shunts are connected in parallel and then placed in a circuit in which the total current flowing is 15A. Calculate the current in amperes indicated in ammeter X.

(c) A 0-1 Ampere moving iron ammeter has an internal resistance of 50 mΩ and inductance of 0.1 mH. A shunt coil is connected to extend its range to 0-10 Ampere for all operating frequencies. Calculate the time constant in milliseconds and resistance in mΩ of the shunt coil respectively.

(d) While measuring power of a three-phase balanced load by the two-wattmeter method, the readings are 100W and 250W. Calculate what will be the power factor of the load.

(e) The load shown in the figure is supplied by a 400V (line-to-line) 3-phase source (RYB sequence). The load is balanced and inductive, drawing 3436 VA. When the switch S is in position N, the three watt-meters W1, W2 and W3 read 577.35 W each. If the switch is moved to position Y, Compute the power indicated by each watt-meters in watts.

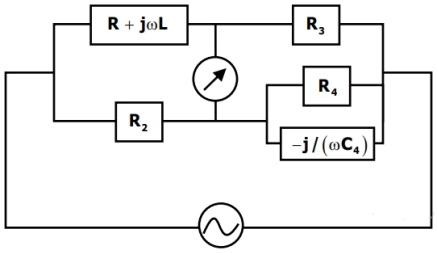


(f) An energy meter, having meter constant of 1200 revolutions/kWh, makes 20 revolutions in 30 seconds for a constant load. Calculate the value of the load in kW.

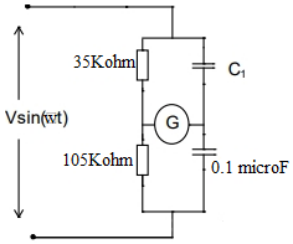
(g) A d.c. potentiometer is designed to measure up to about 2V with a slide wire of 800 mm. A standard cell of emf 1.18V obtains balance at 600 mm. A test cell is seen to obtain balance at 680 mm. Calculate the emf of the test cell.

(h) A 500A/5A, 50 Hz current transformer has a bar primary. The secondary burden is a pure resistance of 1Ω and it draws a current of 5A. If the magnetic core requires 250 AT for magnetization, find the percentage ratio error.

(i) The bridge shown in the figure is at balance; calculate the parameters (R and L) of the inductive coil.



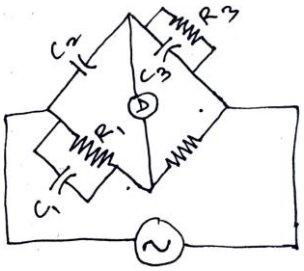
(j) In the bridge circuit shown, the capacitors are loss free. At balance, calculate the value of capacitance C_1.



(10×3=30)

Q.2 A watt-hour meter is calibrated to measure energy on a 250 V supply. One test a steady current of 15.0 A is passed through it for 5 hours at unity power factor. If the meter readings before and after the test are 8234.21 kWh and 8253.13 kWh respectively, calculate the percentage error. If the disc makes 290 revolutions during 5 min when a current of 20 A is passing through the meter at 250 V and 0.87 p.f., Calculate the meter constant **(7)**

Q.3 In AC bridge as shown in Figure , determine C_1 and R_1 and associate loss angle, if balance is obtained at 400 Hz with C_2=C_3=0.01μF, R_3=4kΩ and R_4=11.5kΩ. Also draw the phasor diagram of the bridge under balanced condition.



(7)

Q.4 What are the different methods of measurement of frequency in the power frequency range. Explain the working of Ratiometer type frequency meter.

(6)

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