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S.E. (Electrical)
ELECTRICAL MEASUREMENTS & INSTRUMENTATION
(2019 Pattern) (Semester - III) (203144)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data if necessary.*

Q1) a) With neat circuit diagram and necessary phasor diagram, prove that in two wattmeter method for measurement of 3 phase power in balanced R-L load, total power, $W_1 + W_2 = \sqrt{3} \, V_L I_L \cos \phi$. **[8]**

b) A circuit takes 10 A at 200 V. The power absorbed is 1000 W. If resistance of current coil is $0.15\,\Omega$ and that of pressure coil is $5000\,\Omega$, calculate the error when **[6]**

   i) Pressure coil is connected on supply side of the circuit

   ii) Pressure coil is connected on load side of the circuit

c) Write a note on low power factor wattmeter. **[4]**

OR

Q2) a) When the power of 3 phase balanced star connected load is measured by single wattmeter method with current coil in R phase and pressure coil between R phase and neutral, it showed 6 kW. The load current is 30 A at 400 V. What will be the reading of wattmeter if connections of current coil remain same but pressure coil is connected between Y and B phases. **[5]**

b) With neat diagram, derive the torque equation of a single phase electrodynamometer type wattmeter. **[7]**

c) Explain error due to inductance of pressure coil in single phase wattmeter. Hence state significance of multiplying factor. **[6]**

P.T.O.

Q3) a) In a test of 30 min duration with a constant current of 12 A through UPF load, meter registered 1.50 kWh. If the meter is subsequently used on 230 V supply, determine its error and state weather meter is running fast or slow. **[5]**

b) Explain with neat diagram and necessary phasor diagrams, how single-phase energy meter can be calibrated at different power factors using resistive load. **[7]**

c) Write a note on TOD meter **[5]**

OR

Q4) a) A single phase energy meter is supplying power to a unity p.f load at 240 V, 4.4 A for a period of 5 hours. **[7]**

i) If disc makes 2400 revolutions, calculate the meter constant

ii) Calculate the p.f. of the load if the load is operated for 4 hours at 240 V, 5 A and meter making 1500 revolutions.

b) Draw neat diagram of induction type energy meter, label all the parts and explain its construction and working. **[10]**

Q5) a) With neat diagram, explain Pirani gauge for measurement of low pressure **[6]**

b) Draw the representation of lissagious patterns for following frequency ratios **[4]**

i) 2:1 ii) 1:3 iii) 1:1 iv) 2:3

c) Give detailed classification of transducers along with examples of each type. **[8]**

OR

Q6) a) Explain construction and working of cathode ray oscilloscope. **[7]**

b) Explain resistive pressure transducers. **[5]**

c) Define pressure? Explain importance of pressure measurement in electrical systems hence give min five units in which pressure can be measured. **[6]**

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Q7) a) With neat diagram, explain capacitive method for level measurement. **[6]**

b) Explain construction and working of bonded and unbonded strain gauge. **[6]**

c) Draw and justify characteristic of LVDT hence give various specifications of LVDT. **[5]**

OR

Q8) a) Explain with neat diagram, construction and working of foil strain gauge **[6]**

b) Explain how level can be measured using hydraulic method. **[7]**

c) Define strain, state importance of displacement measurement in electrical system. **[4]**

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