

**ELECTRICAL MEASUREMENT AND
MEASURING INSTRUMENT**

(Code : EET-402)

Full Marks : 70

Time : 3 hours

Answer any five questions

Figures in the right-hand margin indicate marks

1. (a) Define Accuracy. 2
- (b) A milli ammeter of range 0-50 mA is require to measure a load current in the range of 0-5A. The milliammeter has an internal resistance of 0.35 ohm. Calculate the value of shunt resistance necessary to active this. 5
- (c) Explain working principle of P.M.M.C. instrument with diagram. 7
2. (a) Define precision. 2

(Turn Over)

- (b) What do you mean by testing of energy meters what are the apparatus required for meter testing. 5
- (c) Explain working principle of dynamometer type wattmeter with figure. 7
3. (a) Define Resolutions. 2
- (b) Write short notes on rotating type phase sequence indicator. 5
- (c) Explain working principle of mechanical resonance type frequency meters. 7
4. (a) Define Sensitivity. 2
- (b) State use of C.T. and P.T. 5
- (c) Explain measurement of medium resistance by wheat stone bridge method. 7
5. (a) Classify resistance. 2
- (b) Explain clamp-on ammeters. 5
- (c) Explain measurement of inductance by Owen Bridge method. 7

6. (a) State Nominal Ratio for C.T. 2
- (b) State and explain Burden for instrument transformer. 5
- (c) Explain measurement of capacitance by L.C.R. bridge method. 7
7. (a) State controlling torque. 2
- (b) Explain gravity control. 5
- (c) State and explain characteristics of Digital meters. 7
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1. (a) Define accuracy. 2
 (b) Explain the different types of dampings. State which type of damping is most efficient ? 5
 (c) With neat sketch explain the operating principle of moving iron type instrument. 7
2. (a) What are the types of moving coil instruments ? Write their names. 2
 (b) What factors should be taken into considerations while selecting the instruments ? 5
 (c) Classify the errors in dynamometer type wattmeter. Explain briefly about error due to pressure-coil inductance. 7
3. (a) What do you mean by callibration of a measuring instrument ? 2
 (b) A moving coil milli-ammeter has a resistance of $4\ \Omega$ and a full scale deflection of 25 mA. Determine the resistance of shunt to be used, so that the instrument could measure currents up to 500 mA. 5
 (c) Show that in two-wattmeter method of 3-phase power measurement the sum of the readings of the two wattmeters gives the total power consumed in a 3-phase circuit, Hence, prove

$$\tan \phi = \sqrt{3} \left(\frac{W_1 - W_2}{W_1 + W_2} \right)$$

Where, ϕ is the phase angle of the load and W_1 and W_2 are the readings of the wattmeters. 7

4. (a) What is the necessity of using copper shading bands in the pressure coil magnet of an induction type wattmeter ? 2
 (b) Explain briefly about the errors in energymeter. 5
 (c) Explain with neat sketch, the working principle of a single phase induction type energy meter. 7
5. (a) State the classification of frequency meters. 2
 (b) State the comparison of current and potential transformers. 5

(Turn Over)

- (c) With neat sketch, explain the principle of operation and working of dynamometer type single phase power factor meter.
6. (a) What is burden ?
- (b) Explain the principle of resistance measurement by Wheatstone's bridge.
- (c) With a neat sketch show the details of the internal circuit diagram of a 'Megger' and explain the method of measurement of insulation resistance.
7. (a) Name one method for measurement of inductance and capacitance.
- (b) Explain briefly the measurement of capacitance by De Sauty bridge method.
- (c) Explain briefly about digital multimeter with a neat block diagram.
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EMMI
(Code : EET-402)

Full Marks : 80

Time : 3 hours

Answer any five questions including Q.Nos.1 & 2
Figures in the right-hand margin indicate marks

1. Answer the following in brief :

2 × 10

- What is clamp-on ammeter ?
- Define tolerance.
- Classify resistance.
- Draw the connection diagram of a 1-phase wattmeter.
- How can you measure both ac & dc quantities ?
- How can the range of an ammeter be extended ?
- Write the major cause of creeping in single-phase induction type energy meter.
- What is the importance of controlling torque in electro-mechanical type instruments.
- What are the main advantages of PMMC instruments ?
- Define "Ratio Error" in current transformer.

2. Answer the following :

5 × 6

- Draw the circuit diagram and explain the operation of 1 ϕ electro-dynamometer type power factor meter.
- Write short notes on Instruments Transformers.
- Explain the measurement of median resistance by Wheatstone bridge method.
- Explain damping arrangement in indicating instruments.
- At its rated load of 25 VA, a 100/5A current transformer has an iron loss of 0.2W and a magnetizing current of 1.5 A. Compute its ratio error and phase angle when supplying rated output to a meter having a ratio of resistance to reactance of 5.
- How will you use a PMMC instrument which gives full scale deflection at 50 mV potential difference and 10 mA current as
 - Ammeter 0-10 A range
 - Voltmeter 0-250 V range.

3. The torque of an ammeter varies as the square of the current through it. If a current of 5A produces a deflection of 90°. What deflection will occur for a current of 3A, when the instrument is

- Spring controlled
- Gravity controlled.

10

(Turn Over)

(2)

4. Explain the different types of damping. State which type of damping is most efficient. 10
 5. Discuss the methods of extension of range of PMMC types of instruments ? 10
 6. Derive the equation for the measurement of unknown inductance by Maxwell bridge method with diagram. 10
 7. With a neat sketch explain the working principle of an electrical resonance type frequency meter. 10
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1. (a) Define Sensitivity. 2
- (b) Explain Deflecting, controlling and damping torque in indicating type of instrument. 5
- (c) Explain the working principle of P.M.M.C. type instruments. 7
2. (a) What do you understand by calibration of a measuring instrument ? 2

(Turn Over)

- (b) Explain the working principle of Rectifier Type instrument. 5
- (c) Explain the working principle of Dynamometer type wattmeter. 7
3. (a) What is the advantage of using shunt and multipliers ? 2
- (b) What are the Errors in Dynamometer type wattmeter and methods of their correction ? 5
- (c) Explain briefly the principle of Single phase Induction type energy meter. 7
4. (a) What is the use of Tachometer ? 2
- (b) Explain the working principle of synchrosopes. 5
- (c) Explain the principle of operation of Electrical resonance type frequency meter. 7
5. (a) What is Burden ? 2

(3)

- (b) Explain the working principle of current transformer. 5
- (c) State uses of CT and PT. 7
6. (a) Name the different types of resistance. 2
- (b) Explain the measurement of high resistance by loss of charge method. 5
- (c) Explain the working principle of megger. 7
7. (a) What is function of Multimeter ? 2
- (b) Explain measurement of capacitance by De Sauty bridge method. 5
- (c) Explain the working principle of Digital Multimeter. 7
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