16172

3 Hours / 100 Marks　　　Seat No. ☐☐☐☐☐☐☐☐

Instructions :　(1)　All Questions are *compulsory.*

　　　　　　　　(2)　Answer each next main Question on a new page.

　　　　　　　　(3)　Illustrate your answers with neat sketches wherever necessary.

　　　　　　　　(4)　Figures to the right indicate full marks.

　　　　　　　　(5)　Assume suitable data, if necessary.

　　　　　　　　(6)　Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1.　Attempt any TEN of the following :　　　　　　　　　　　**20**

(a)　State the meaning of absolute instrument and secondary instrument.

(b)　Write any two difference between indicating and integrating instruments.

(c)　State the use of shunt and series resistance used in extension of meter.

(d)　Define :–　(i)　Accuracy

　　　　　　　　(ii)　Resolution

(e)　Name the material used for :–

　　　(i)　Moving coil

　　　(ii)　Permanent magnet in PMMC instrument.

(f)　Define balanced and unbalanced load in a 3 ϕ circuit.

(g)　List any two methods of reactive power measurement in 3 ϕ circuit.

(h)　State the meaning of creeping error in 1ϕ energy meter.

(i)   A wattmeter has a voltage range of 300V and current range of 10A. If the FSD of meter is 1500 watt, then calculate the multiplying factor of meter.

(j)   Write any two factors on which earth resistance depends.

(k)   State the use of :–

   (i)   Clip-on-ammeter

   (ii)   Phase sequence indicator

(l)   Draw circuit for A.C. voltmeter using PMMC movement and potential transformer construction.

2.   **Attempt any FOUR of the following :**   16

(a)   List out any four effects of electric current used in measuring instruments & write name of meter working on it.

(b)   Give the classification of the errors used in measuring instrument & state the reason for their occurrence.

(c)   Name the different torque and their function in measuring instrument.

(d)   A moving coil instrument has a FSD of 10 mA when potential difference across it is 100 mV. Calculate the shunt resistance required to extend range of meter to 100A.

(e)   Write equations for all powers. State their unit. Draw the power triangle.

(f)   Compare PMMC and MI instrument on any four points.

3. **Attempt any FOUR of the following :** 16

   (a) Describe spring control method of producing controlling torque in measuring instrument. Write any two properties required for spring material.

   (b) Write any four differences between CT and PT.

   (c) Draw a neat labelled diagram of PMMC instrument to show its construction.

   (d) Derive equation for shunt resistance calculation in ammeter range extension.

   (e) Draw a neat sketch of repulsion type moving Iron instrument.

   (f) Write any four advantages of digital energy meter over analog type.

4. **Attempt any FOUR of the following :** 16

   (a) Draw a neat labelled diagram of dynamometer type wattmeter to measure power in 1 ϕ AC circuit.

   (b) State the effect of power factor variation on reading of wattmeter in two wattmeter method for 3 ϕ circuit.

   (c) Draw a neat connection diagram to measure active power in 3ϕ circuit by using two wattmeter method. Also draw the relevant phasor diagram.

   (d) Compare CC and PC of wattmeter on the basis of :–

      (i) Connection

      (ii) Status

      (iii) Number of turns

      (iv) Gauge of wire.

   (e) Describe the connection error that occur in dynamometer type wattmeter with a neat diagram.

   (f) A 3ϕ, 500V Induction motor has a power factor of 0.4. The input power is 30 kW. calculate readings of the wattmeter in two wattmeter method used to measure the input power.

5. **Attempt any FOUR of the following :** 16

    (a) Draw a neat sketch of 1ϕ induction type energy meter and write its principle of working.

    (b) Write the working of L-C-R meter with suitable sketch.

    (c) 1ϕ Energy meter has a Constant of 6000 rev/kWh. A test was carried out with a resistive load for 1 min. during which meter made 40 revolutions. The voltage was 110 volt and current of 3A. Find out the percentage error.

    (d) With a neat sketch explain working of 1ϕ dynamometer type power factor meter.

    (e) State the working principle of Weston type frequency meter with a neat diagram.

    (f) Draw a neat labelled diagram to describe construction of megger.

6. **Attempt any FOUR of the following :** 16

    (a) Name the method used to measure following resistances:–

        (i) Low resistance

        (ii) Medium resistance

        (iii) Insulation resistance

        (iv) Earth resistance

    (b) 'PMMC instrument is not suitable to measure AC quantity'. State the reason.

    (c) Draw a neat sketch of 3ϕ induction type energy meter and label it.

    (d) With a neat diagram, explain the working of clip-on-ammeter.

    (e) Draw a labelled block diagram of sine wave generator and state function of each block.

    (f) State any eight applications of CRO.

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