17404

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

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

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-Programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any TEN of the following :**   **10 × 2 = 20**

(a) Define rms value of an alternating quantity.

(b) Draw a neat labelled diagram of PMMC instrument.

(c) State any two applications of digital multimeter.

(d) State the function of commutator in D.C. motor.

(e) Define transformer.

(f) What is transformation ratio of a transformer ?

(g) What is slip of an induction motor ? What is its value at standstill condition ?

(h) Name any four safety tools used in industry.

(i) What is energy audit ?

(j) Draw the speed-torque characteristics of 3-phase induction motor.

(k) State the method to reverse the direction of rotation of 3-phase induction motor.

(l) State any two applications of electrical machines in electroagro system.

2. Attempt any FOUR of the following : **4 × 4 = 16**

(a) Draw the single line diagram of electrical power system and mark the voltages.

(b) Define the following terms as referred to an alternating quantity :

    (i) Cycle

    (ii) Frequency

    (iii) Maximum value

    (iv) Average value

(c) State any four advantages of three phase system over single phase system.

(d) What is line voltage and phase voltage ? Draw star connected 3-phase supply system and mark line voltage and phase voltage.

(e) The current flowing through a circuit is $i = 14.14 \sin (314\,t - \frac{\pi}{6})$. Find

    (i) Frequency

    (ii) Phase difference

    (iii) RMS value of current

    (iv) Amplitude

(f) Explain the principle of working of dip-on ammeter. Where is it used ?

3. Attempt any FOUR of the following : **4 × 4 = 16**

(a) Explain the working principle of d.c. motor and explain the significance of back e.m.f.

(b) Draw the experimental setup to determine regulation and efficiency of the given 1 kVA, 230/115 V, 50 Hz, single phase transformer. Also give the meter ranges.

(c) Explain the working of Autotransformer with diagram.

(d) A capacitor having a capacitance of 10 microfarad is connected in series with a non-inductive resistance of 120 ohm across 100 V, 50 Hz supply. Calculate :

    (i) Current

    (ii) Impedance

    (iii) Phase difference between current and supply voltage

    (iv) Power

(e) A balanced three-phase delta connected load consists of three resistances each of four ohms connected to a 400 V, 3-phase, 50 Hz supply.

Find (i) Phase voltage

(ii) Phase current

(iii) Line current

(iv) Power consumed

(f) Derive the e.m.f. equation of a transformer.

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

(a) Classify transformers according to

(i) no. of phase

(ii) construction

(iii) voltage

(iv) application

(b) Draw a neat labelled diagram of star-delta starter and write any one advantage of this starter.

(c) How speed control of induction motor is done by VFD ?

(d) State any four advantages of electric drives over any other types of drives.

(e) What is universal motor ? Where is it used ? State its types.

(f) Explain the working principle and operation of self excited alternator.

5. Attempt any FOUR of the following : **4 × 4 = 16**

(a) Explain the construction of three phase induction motor with diagram.

(b) Explain the working of single phase capacitor start induction motor.

(c) What is (i) Resistance heating (ii) Induction heating (iii) Dielectric heating ?

(d) A six pole 50 Hz induction motor has a slip of 2.5%. Find its actual speed and slip speed.

(e) Classify electric drive. Explain each type in brief.

(f) Explain the concept and principle of electroplating with neat sketch.

6. **Attempt any FOUR of the following :** $4 \times 4 = 16$

   (a) Explain the principle of eddy current heating in detail.

   (b) Draw the wiring diagram for control of one lamp and one fan by two different switches.

   (c) Write the function of (i) MCB (ii) ELCB (iii) Fuse.

   (d) State the necessity of earthing. Compare equipment earthing and neutral earthing on any three points.

   (e) Explain metal arc welding with diagram.

   (f) Explain in brief four different fire extinguishing methods adopted in electrical engineering.

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