Total No. of printed pages = 4

ELEMENTS OF ELECTRICAL ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer all questions.

1. (a) Define conductor and insulator.   2

   (b) Identify conductor and insulator from the following materials :   2

   PVC, Copper, Tungsten, Mica, Porcelain, ACSR.

   (c) What would happen if potential difference is applied at the two ends of a conductor ?

                    1

2. (a) Define power.   1

   (b) Write down the unit of power and electrical energy.   1

[Turn over

(c) Establish the relationship between KWh and joule. 2

(d) What is B.O.T unit? 1

3. (a) Determine the voltage sign of battery EMF in applying Kirchhoff's laws. 2

(b) Find out the current flowing through 15Ω resistance connected in the circuit given below by using Kirchhoff's laws. 6
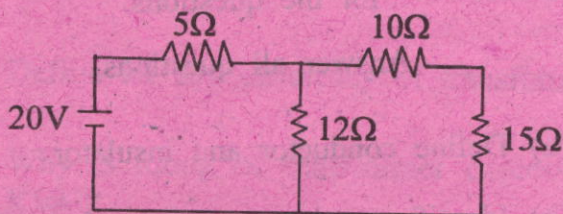
4. (a) Write down the differences between primary cell and secondary cell. 2

(b) What are the active materials of a lead acid battery? 2

(c) What is the unit of capacity of a lead acid battery? 1

(d) State the chemical reactions that take place during charging of a lead acid battery. 2

5. (a) Write down the functional difference between d.c generator and d.c motor. 2

   (b) Deduce the EMF equation of a d.c generation. 5

6. (a) Define back emf of a d.c. motor. 2

   (b) A 220V d.c machine has an armature resistance of 0.5Ω. If the full load armature current is 20A, find the induced emf when the machine acts as

   (i) Generator

   (ii) Motor. 5

7. An alternating current of frequency 50 Hz has a maximum value of 120A. Write down the equation for its instantaneous value. Reconing time from the instant the current is zero and is becoming positive, find

   (a) the instantaneous value after $\frac{1}{360}$ se and

   (b) the time taken to reach 96A for the 1st time. 1+3+3=7

8. (a) Define power factor. 1

   (b) A resistance of 15Ω is connected in series with an inductance of 0·1H. The circuit is connected across a 230V, 50 Hz supply. Find
   (i) Inductive reactance
   (ii) Impedance

   (iii) Current flowing through the circuit

   (iv) Power factor of the circuit. 1½×4=6

9. (a) Derive the EMF equation of transformer. 5

   (b) Define all day efficiency of transformer. 2

   (c) Why is rating of transformer expressed in KVA ? 3

10. (a) What are the advantages of induction motor ? 4

   (b) Why does the rotor of induction motor rotate ? 3