C14–EE–**106**

4046

BOARD DIPLOMA EXAMINATION, (C–14)
OCT/NOV—2015
DEEE—FIRST YEAR EXAMINATION

BASIC ELECTRICAL ENGINEERING

Time : 3 hours]   [*Total Marks* : 80

PART—A   3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. State Ohm's law and give the equation with units.

2. Develop an expression for equivalent resistance, when three resistors are connected in parallel.

3. Define *(a)* electrical work and *(b)* electrical energy.   1½+1½

4. State Joule's law of electric heating.

5. State in brief the right hand thumb rule.

6. Draw the field pattern due to current in a straight current-carrying conductor.

7. State and briefly explain Lenz's law.

8. Define *(a)* self-inductance and *(b)* mutual inductance.   1½+1½

9. State Coulomb's law of electrostatics.

10. Define capacitance and state its unit.   2+1

<center>**PART—B**   10×5=50</center>

Instructions : (1) Answer *any* **five** questions.

                (2) Each question carries **ten** marks.

                (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A semicircular ring of copper has an inner radius of 10 cm, radial thickness 8 cm and axial thickness 6 cm. Calculate the resistance of the ring at 80 °C between its two end faces, specific resistance of copper at 20 °C is 1.7×10^{6} -cm and temperature coefficient of copper at 0 °C is 0·0043/ °C.   10

12. *(a)* Three lamps are connected in series across a 120 V supply and take a current of 1·5 A. If the resistances of two lamps are 25 and 35 , then what is the resistance of the third lamp?   4

      (b) Derive the formula for coefficient of resistance at any temperature as $_t$ $_0 / (1$ $_0 t)$.   6

13. A house has the following loads :

      (a) 5 lamps of 60 W each, working for 8 hours a day

      (b) 4 lamps of 100 W each, working for 5 hours a day

      (c) 2 heaters of 1000 W each, working for 3 hours a day

      (d) 5 fans of 80 W each, working for 12 hours a day

      Calculate the January bill, if rate of charge is rupees 0·50 per unit. Add rupees 10 as a meter rent per month.   10

14. An immersion heater which is to operate on 230 V supply has to raise the temperature of 45·36 kg of water from 20 °C to 90 °C in one hour. Taking the efficiency of operating as 86%, determine *(a)* the rating of the heater and *(b)* the resistance of the heating element in the heater. Calculate also the cost of heating operation if energy costs 70 paise per unit.   5+5

15. An iron ring 300 cm mean circumference with a cross- section of 5 cm^2 has a saw cut 1 mm wide in it. The ring is wound uniformly with 350 turns of wire. Find the current required to produce a flux of 0·3 milliweber across the gap. Assume a leakage factor is 1·2 and relative permeability for iron is 800.   10

16. *(a)* State and explain Faraday's laws of electromagnetic induction.   4

(b) If two identical coils have an equivalent inductance of 0·08 H and 0·035 H, find the mutual inductance and coefficient of coupling, when fluxes are *(i)* aided and *(ii)* opposing.   6

17. *(a)* Derive the expression for the energy stored in a magnetic field.   5

(b) Develop an expression for lifting power of a magnet.   5

18. *(a)* Derive an expression for energy stored in a capacitor.   5

(b) Two small balls having charges one double the other are placed at a distance of 0·6 m apart in air. If the repulsive force between the balls is 2·70 newton, determine the charge on each ball.   5

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