C14–EE–**106**

4046

BOARD DIPLOMA EXAMINATION, (C–14)
OCT/NOV—2017
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. Define *(a)* resistance and *(b)* electric current.

2. Define temperature coefficient of resistance and give the equation with units.

3. Define *(a)* electrical work and *(b)* electric power.

4. Define thermal efficiency.

5. State Biot–Savart law.

6. Define *(a)* magnetic flux, *(b)* reluctance and *(c)* permeability.

7. State coefficient of coupling.

8. Find the area required for such an electromagnet to have a lifting power of 400 kg with a flux density of 0·1 weber/meter^2.

9. Plot the electrostatic field due to *(a)* isolated positive charge and *(b)* isolated negative charge.

10. State and explain Gauss theorem.

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)* Derive the expression for resistance at any temperature as $R_t = R_0(1 + \alpha_0 t)$. 4

(b) The resistance of a solid conductor of diameter 0·5 cm and length 3 m is 0·00945 Ω. Calculate the resistance of a hollow conductor of same material having internal and external diameter as 4·5 mm and 6 mm respectively, its length being 200 cm. 6

12. *(a)* Derive an expression for equivalent resistance, when three resistors are connected in series. 4

(b) A circuit consists of two parallel resistors, having resistance 20 Ω and 30 Ω respectively connected in series with 15 Ω. If current through 15 Ω resistor is 3 A, find *(i)* the current through 20 Ω and 30 Ω resistors, *(ii)* the voltage across the whole circuit and *(ii)* the total power. 6

13. A household has following load :

(a) 10 lamps of 60 W each, working of 10 hours a day

(b) 1 electric iron of 450 W, working for 1 hour a day

(c) 8 fans of 80 W each, working for 12 hours a day

(d) 1 heater of 1000 W, working for 1 hour a day

(e) 1 refrigerator 250 W, working for 12 hours a day

Calculate the monthly bill, if rate of charge per unit is ₹ 1·20 plus ₹ 20 as meter rent. 10

14. *(a)* Explain the Joule's law of electric heating. 4

(b) An electric kettle is marked 500 W, 230 V and was found to take 15 minutes to raise 1 kg of water from 15 °C to boiling point. Calculate the efficiency of kettle. 6

15. A circular iron ring of 20 cm in diameter has an air-gap of 1 mm wide cut in it. The area of the cross-section of the ring is 3·6 cm^2. Calculate the number of amp-turns needed to setup a flux of 0·5 milli weber in the air gap. Neglect leakage and fringing. Assume relative permeability for iron is 800.   10

16. *(a)* Obtain an expression for total inductance when two coils connected in series fluxes are *(a)* aiding and *(b)* opposing.   6

   (b) The combined inductance of two coils connected in series is 0·6 H and 0·1 H, depending on the relative directions of the currents in the coils, if one of the coils when insulated has a self-inductance of 0·2 H, calculate *(i)* the mutual inductance and *(ii)* the coupling coefficient.   4

17. *(a)* State Faraday's laws of electromagnetic induction.   4

   (b) Derive the expression for the energy stored in a magnetic field.   6

18. *(a)* State Coulomb's laws of electrostatics.   4

   (b) Three capacitors, having capacitances of 10 F, 30 F and 90 F are connected in parallel across 220 V supply. Find the equivalent capacitance and the charge on each capacitor.   6

★ ★ ★