



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 $0.1 \text{ weber/meter}^2$.
9. Plot the electrostatic field due to (a) isolated positive charge and (b) isolated negative charge.
10. State and explain Gauss theorem.

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PART—B

10×5=50

- 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 (iii) 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
