7040

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

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 specific resistance and state its SI units. 2+1

2. Find the resistance of solid single core copper cable having its core cross-sectional area 15 mm^2 and length 500 m. Take the resistivity of copper wire as 2×10^{-8} Ω-mt. 3

3. Define electrical power and mention its unit. 2+1

4. State Joule's law of electric heating. 3

5. Define thermal efficiency. 3

6. State Biot-Savart's law. 3

7. An iron ring with a mean diameter of 24 cm is wounded with 400 turns to carry a current of 1.5 ampere. Calculate the magnetizing force. 3

8. State Faraday's laws of electromagnetic induction. 3

9. Classify the types of induced e.m.f. 3

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

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PART—B

8×5=40

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

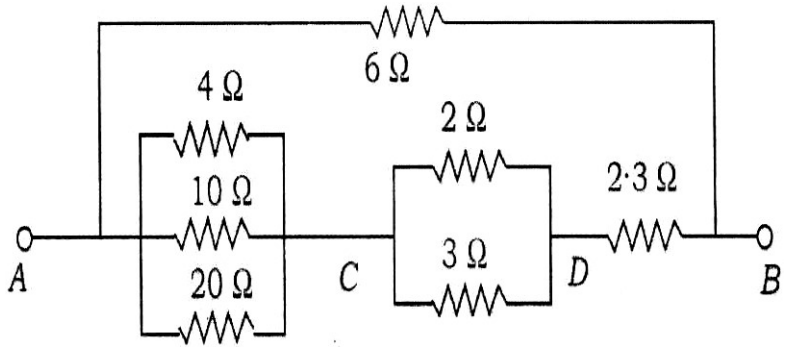
(2) Each question carries **eight** marks.

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

11. *(a)* A platinum wire of cross-sectional area 2 mm^2 has a resistance of 30Ω. Determine *(i)* the resistance of the wire of the same length, if its cross-sectional area is 6 mm^2 and *(ii)* the cross-sectional area of the wire of the same length, if the resistance is 16Ω. Consider same type of material in both the cases. 4+4

(OR)

(b) Calculate the equivalent resistance between the *AB* terminals and also find the total current if the voltage across *AB* is 15 V. 5+3



12. *(a)* A domestic electric installation consists of the following loads : 8

(i) 8 numbers of lamps 60 W each working for 6 hr/day

(ii) 5 numbers of fans 80 W working for 8 hr/day

(iii) One electric heater 1000 W working for 2 hr/day

(iv) One electric motor 1·5 H.P. working for 4 hr/day at an efficiency of 80%.

Calculate the electricity bill if rate per unit is ₹1·5 plus ₹15 as meter rent for the month of September. 8

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(OR)

(b) Find the power dissipated by *(i)* a resistor of 2 kΩ carrying a current of 100 mA and *(ii)* a resistor of 5 kΩ having a p.d. of 5 kV. Find also the p.d. across *(iii)* a resistor of 10 kΩ dissipating a power of 10 W and *(iv)* a resistor dissipating a power of 10 W while carrying a current of 50 mA. 2×4

13. *(a)* Distinguish between magnetic circuits and electric circuits in eight aspects. 8

(OR)

(b) Derive an expression for the force between two parallel current carrying conductors and hence state the nature of force between the two conductors for either direction of currents. 6+2

14. *(a)* Two coils with a coefficient of coupling 0.6 between them are connected in series so as to magnetize *(i)* in the same direction and *(ii)* in the opposite direction. The corresponding values of total inductances are 2.02 H and 0.53 H respectively. Determine the self-inductance of the two coils and the mutual inductance between them. 8

(OR)

(b) Obtain an expression for total inductance when two coils connected in series fluxes are *(i)* aiding and *(ii)* opposing. 4+4

15. *(a)* State Coulomb's laws of electrostatics and derive an expression for the energy stored in a capacitor. 3+5

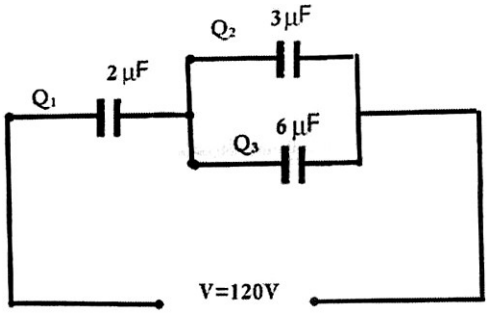
(OR)

(b) For the circuit arrangement shown in the figure below, calculate : 2+3+3

(i) Equivalent capacitance;

(ii) Potential difference across each capacitor;

(iii) Charge on each capacitor.



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PART—C

10×1=10

Instructions : (1) Answer the following question.

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

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

16. *(a)* An electric kettle contains 1.5 kg of water at 15 °C. It takes 15 minutes to raise the temperature to 95 °C. Assuming the heat losses due to radiation and heating the kettle is 14 kcal, find the current taken when it is connected to 250 volts supply. 5

(b) A parallel plate air capacitor of area 25 cm^2 and with plates 1 mm apart is charged to a potential of 100 volts. Calculate the energy stored in the capacitor. 5

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