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C20-EE–106

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BOARD DIPLOMA EXAMINATION, (C-20)

FEBRUARY/MARCH —2022

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. Compare between the conductor and insulator with respect to valence electrons.

2. List the limitations of Ohm's law.

3. Define electrical power. Mention their electrical and mechanical units.

* **4.** Draw the figure of an incandescent bulb and mention its parts.

5. State Fleming's right-hand rule.

6. Draw the magnetic field patterns due to *(a)* solenoid and *(b)* toroid.

7. Define work law of magnetic and mention their applications.

8. Classify an induced emf.

9. State Coulomb's law of electrostatics.

10. State uses of capacitors.

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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 conductor wire has a resistance of 5 Ω. What will be the resistance of the wire, if its diameter is reduced to half and length increased four times?

(b) Calculate the effective resistance when three resistances 10 Ω, 15 Ω and 25 Ω are connected in *(i)* series and *(ii)* parallel.

(OR)

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

(d) The resistance of a conductor at 10 °C is 5 Ω and at 100 °C is 12 Ω. Find the resistance at 0 °C and also find temperature co-efficient at 40 °C.

12. Calculate the monthly electricity bill of domestic service with the following loads for a month of 31 days :

(a) 10 lamps of 60 W each used for 5 hours a day.

(b) 2 kW immersion heater used for 4 hours a day.

(c) 5 fans of 100 W each used for 10 hours a day.

(d) 2 HP electrical motor with efficiency 80% working 1 hour a day. The cost per unit of consumption is 350 paisa and meter rent <25/month.

(OR)

Two lamps of rating 220 V, 60 W and 220 V, 40 W are connected in series across 220 V DC supply. Calculate the voltage across each

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lamp and power consumption. What will be the power consumption if the two lamps are connected in parallel?

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13. *(a)* Derive a formula for the force between two parallel current carrying conductors.

(b) An iron ring has cross-sectional area of 400 m^2 and a mean diameter of 250 mm. An air gap of 1 mm has been made by a saw-cut across the section of the ring. If a magnetic flux of 0.3 mWb is required in the air gap, find the current necessary to produce this flux when a coil of 400 turns is wound on the ring. The iron has a relative permeability of 500. Neglect the effect of magnetic leakage and fringing.

(OR)

(c) Compare magnetic circuit with electric circuit in any four aspects.

(d) A straight conductor of length 5 m, carrying a current of 200 A is placed in a uniform magnetic field of flux density 1.5 tesla. Calculate the force developed on the conductor, when it is placed *(i)* at right angle and *(ii)* at 30° to the magnetic field.

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

(b) Calculate the inductance of a coil in which of 0.2 A increased at the rate of 0.4 A per second represents a power of 0.4 watt.

(OR)

(c) Derive an expression for total and equivalent inductances when two inductances are connected in (i) Series aiding and (ii) series opposing.

* **15.** *(a)* Draw the electrostatic field pattern due to *(i)* isolated negative charge and *(ii)* like charges placed side by side.

(b) Three capacitors of 10 μF, 20 μF and 40 μF are connected in series across a voltage of 400 V. Calculate *(i)* equivalent capacitance, *(ii)* charge on each capacitor and *(iii)* potential difference across each capacitor.

(c) Three point charges of $+12\times10^{-9}$C, $+30\times10^{-9}$C and $+20\times10^{-9}$C are placed at the corners of *A*, *B*, *C* of a square *ABCD* having each side 3 cm. Calculate the electric intensity at the corner *D*. Assume air as a medium.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. *(a)* Derive $\alpha_t = \alpha_0/(1 + \alpha_0 t)$.

(b) Explain the energy stored in a magnetic field.

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