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C20-EE–106

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BOARD DIPLOMA EXAMINATION, (C-20)

SEPTEMBER/OCTOBER—2021

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 semiconductor with respect to valence electrons.

2. State the Ohm's law.

3. Define *(a)* electrical work and *(b)* electrical power, and mention their units.

4. State Joule's law of electric heating.

5. Define the following terms :

(a) Magnetic flux

(b) Magnetic flux density

6. Draw the magnetic field patterns due to *(a)* Solenoid and *(b)* Toroid.

7. Calculate coefficient of coupling for two coils having self inductances of 60 mH and 80 mH. The mutual inductance between them is 50 mH.

8. State the dynamically induced EMF.

9. Draw the electrostatics field pattern due to *(a)* unlike charges side by side and *(b)* isolated positive charge.

10. List the factors affecting capacitor materials.

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.

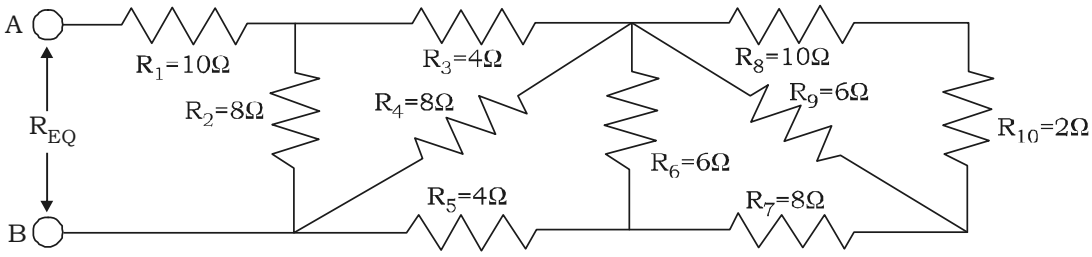
11. *(a)* Derive the equivalent parallel resistance :

$$1/R_{EQ} = 1/R_1 + 1/R_2 + 1/R_3 + \text{-----} + 1/R_n$$

(b) A copper wire has a resistance of 30Ω at 40°C. Calculate the resistance at 140°C, given that temperature coefficient of resistance at 40°C is 0·00365/°C.

OR

(c) Find the equivalent resistance, R_{EQ} for the following resistor combination circuit.



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

(i) 6 lamps of 100 W each used for 8 hours a day.

(ii) 2000 W immersion heater used for 1 hour a day.

(iii) 6 fans of 80 W each used for 10 hours a day.

(iv) 1000 W electrical iron used for 1 hour a day. The cost per unit of consumption is 350 paisa and meter rent 25/month.

OR

(b) Two lamps of rating 220V, 60 W and 220V, 100W are connected in series across 220 V DC supply. Calculate the voltage across each lamp and power consumption. What will be the power consumption if the two lamps are connected in parallel?

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

(b) An iron ring has cross-sectional area of 400 mm^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 0·5 m, carries a current of 100 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 coefficient of coupling for two coils having self inductances of 60 mH and 80 mH. The mutual inductance between them is 40 mH.

OR

(c) Derive an expression for total and equivalent inductances when two inductances are connected *(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) Two capacitors of 10 pF and 40 pF 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.

OR

(c) Three identical point charges of +5 mC each are placed at the vertices of an equilateral triangle 10 cm apart. Calculate the force on each charge. Assume the medium is air.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) Its carries **ten** marks.

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

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

(b) Derive an expression for equivalent capacitance when three capacitors are connected in series.

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