PART—A   3×10=30

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

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

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. State Ohm's law.

2. Define the terms *(a)* resistance and *(b)* resistivity.

3. Define work, power and energy, and give their SI units.

4. Define thermal efficiency.

5. Give expressions for field strength *(a)* at centre of circular conductor, *(b)* at any point on the axis of a circular conductor and *(c)* around a straight conductor.

6. State Fleming's left-hand rule and its application.

7. State and explain Lenz's law.

8. Define coefficient of coupling and 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.

9. Define absolute and relative permittivity.

10. The capacitance of a capacitor formed by two parallel metal sheets, each 100 cm^2 in area, separated by a dielectric 2 mm thick is 2×10^{-10} F. Determine the relative permittivity of the dielectric.

PART—B $10 \times 5 = 50$

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 equivalent resistance when three resistances are connected in parallel. 5

(b) The resistance of 360 m of a wire is $90 \, \Omega$. How much length of the same volume of wire will have a resistance of $125 \, \Omega$? 5

12. Find the total current I in the given circuit : 10
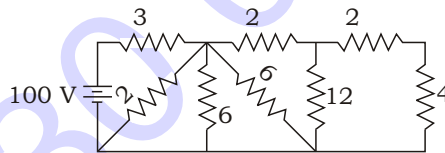
13. A house has the following loads :

(a) 8 lamps 60 W each working for 6 hr/day

(b) 5 fans 80 W each working for 8 hr/day

(c) 3 electric heaters 1000 W each working for 2 hr/day

(d) 1 electric motor 1·5 HP 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. 10

14. *(a)* List the application of *(a)* space heater and *(b)* infrared lamp. 4

(b) An electric heater contains 4 liters of water initially at a mean temperature of 15 °C. 0·25 kWh is supplied to the water by the heater. Assuming no heat losses, what is the final temperature of the water? 6

15. *(a)* Derive an expression for magnitude of the force on a conductor in a magnetic field. 4

(b) A straight conductor of length 0·5 m and carries a current of 100 A is placed in a uniform magnetic field of flux density 1·5 tesla. Calculate the force developed on a conductor, when it is placed *(i)* at right angle, *(ii)* in parallel and *(iii)* at an angle of 30° to the magnetic field. 6

16. *(a)* Derive an expression for lifting power of a magnet. 4

(b) An inductor with 10   resistance and 200 mH inductance is connected to 24 V d.c. supply. Calculate the energy stored in the inductance and power absorbed. 6

17. *(a)* Explain the self-inductance and derive an expression for it. 6

(b) A coil has 400 turns. Find the induced e.m.f. in it, if the flux changes from 0·2 mWb to 1 m Wb in 0·2 second. 4

18. *(a)* State and explain Columb's law of electrostatics. 4

(b) Derive an expression for the capacitance of a parallel-plate capacitor. 6

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