14–6 Convert the following values of mmf to gilberts (Gb):

a. 100 A•t.

b. 30 A•t.

c. 500 A•t.

14–7 Convert the following values of mmf to ampere-turns (A•t):

a. 126 Gb.

b. 37.8 Gb.

c. 630 Gb.

SECTION 14–2 FIELD INTENSITY (*H*)

14–8 What is (a) the cgs unit of field intensity? (b) the SI unit of field intensity?

14–9 Calculate the field intensity, *H*, in ampere-turns per meter, for each of the following cases:

a. mmf = 100 A•t, l = 0.2 m.

b. mmf = 25 A•t, l = 0.25 m.

c. mmf = 4 A•t, l = 0.08 m.

d. mmf = 20 A•t, l = 0.1 m.

14–10 Calculate the field intensity, *H*, in ampere-turns per meter, for each of the following cases:

a. I = 40 mA, N = 500 turns, l = 0.2 m.

b. I = 100 mA, N = 1000 turns, l = 0.5 m.

c. I = 60 mA, N = 600 turns, l = 0.25 m.

d. I = 10 mA, N = 300 turns, l = 0.075 m.

14–11 Convert the following values of field intensity to oersteds:

a. 50 A•t/m.

b. 150 A•t/m.

14–12 Convert the following values of field intensity to A•t/m.

a. 0.63 oersteds.

b. 1.89 oersteds.

14–13 Calculate the absolute permeability, μ, of a material if its relative permeability, μ_r, equals

a. 10.

b. 50.

c. 100.

d. 500.

e. 1000.

14–14 A coil with an iron core has a field intensity, *H*, of 50 A•t/m. If the relative permeability, μ_r, equals 300, calculate the flux density, *B*, in teslas.

14–15 Calculate the relative permeability, μ_r, of an iron core when a field intensity, *H*, of 750 A•t/m produces a flux density, *B*, of 0.126 T.

14–16 Calculate the field intensity, *H*, of an electromagnet if the flux density, *B*, equals 0.504 teslas and the relative permeability of the core is 200.

SECTION 14–3 *B–H* MAGNETIZATION CURVE

14–17 Referring to the *B–H* curve in Fig. 14–3, calculate the absolute permeability, μ, in SI units for the iron core at a field intensity, *H*, of

a. 3000 A•t/m.

b. 5000 A•t/m.

SECTION 14–9 GENERATING AN INDUCED VOLTAGE

14–18 A magnetic field cuts across a coil of 500 turns at the rate of 100 μWb/s. Calculate v_{ind}.

14–19 A magnetic field cuts across a coil of 400 turns at the rate of 0.02 Wb/s. Calculate v_{ind}.

14–20 A magnetic flux of 300 Mx cuts across a coil of 1500 turns in 200 μs. Calculate v_{ind}.

14–21 The magnetic flux surrounding a coil changes from 1000 to 6000 Mx in 5 μs. If the coil has 200 turns, how much is the induced voltage?

14–22 A coil has an induced voltage of 1 kV when the rate of flux change is 0.5 Wb/s. How many turns are in the coil?

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14–23 Derive the value of 1.26×10^{-6} T/(A•t/m) for μ_0 from $\mu = B/H$.

14–24 What is the relative permeability (μ_r) of a piece of soft iron whose permeability (μ) equals 3.0×10^{-3} T/(A•t/m)?

14–25 Refer to Fig. 14–23*a*. Calculate (**a**) the total wire resistance R_W of the No. 12 gage copper wires; (**b**) the total resistance R_T of the circuit; (**c**) the voltage available across the load R_L; (**d**) the I^2R power loss in the wire conductors; (**e**) the load power P_L; (**f**) the total power P_T consumed by the circuit; (**g**) the percent efficiency of the system calculated as $(P_L/P_T) \times 100$.

14–26 Refer to Fig. 14–23*b*. Calculate (**a**) the total wire resistance R_W of the No. 20 gage copper wires; (**b**) the total resistance R_T of the relay coil circuit; (**c**) the voltage across the relay coil; (**d**) the I^2R power loss in the No. 20 gage copper wires in the relay coil circuit; (**e**) the total wire resistance R_W of the 10-ft length of No. 12 gage copper wires that connect the 16-Ω load R_L to the 240-Vac power line; (**f**) the voltage available across the load R_L; (**g**) the I^2R power loss in the 10-ft length of the No. 12 gage copper wire; (**h**) the load power P_L; (**i**) the total power P_T consumed by the load side of the circuit; (**j**) the percent efficiency of the system calculated as $(P_L/P_T) \times 100$.

14–27 Explain the advantage of using a relay rather than an ordinary mechanical switch when controlling a high-power load a long distance away. Use your solutions from Critical Thinking Probs. 14–25 and 14–26 to support your answer.