73+8=81% B good... for some.   J6   Now 545/600=90.8% A-avg.

 NAME JAMES HAYNES

AT THE RIGHT OF THE PAGE, FILL IN THE "o" OF THE BEST ANSWER, FOR EXAMPLE, d●.

>IF YOU DON'T KNOW IT, RULE OUT THE OBVIOUSLY WRONG ANSWERS AND THEN *GUESS*.<

1. Four equations, called ________________________, describe classical electromagnetism. (One version will be the answers to the first four questions on your final. Another version was on a T-shirt I wore to class Friday.)

a) Maxwell's equations
b) Faraday's laws
c) Lenz's laws
d) Gauss's laws

a● bo co do 1.

2. The magnetic flux through a rigid closed loop is constant at 0.008 Wb. At t = 6 s, the integral around that closed loop of the scalar (dot) product of the electric field and the infinitesimal length vector equals _________ V.

$\Phi_B = .008$ Wb

a) $-\frac{0.008}{6}$ b) zero c) – 0.008 d) – 0.008(6)

a● bo co do 2.

3. ____________________ are induced currents that circulate within the volume of a conducting material.

a) Lenz's loops
b) Maxwell movements
c) Ampere's amperages
d) Eddy currents

ao bo co d● 3.

4. The energy density is 3.3 J/m³ in a 0.095 T magnetic field within a linear ferromagnetic material of permeability 1.37 × 10⁻³ T·m/A. In this problem, 3.3 J/m³ is the value of ___.

a) μ (mu) b) U c) B d) u

ao bo co d● 4.

5. In problem 4 above, 1.37 × 10⁻³ T·m/A is the value of ___.

a) μ (mu) b) U c) B d) u

a● bo co do 5.

6. A rigid circular conducting loop is at rest in the plane of the paper. If the *induced* magnetic field at the center of the loop is out of the paper (⊙), the *induced* current in the loop is ________________.

a) zero b) clockwise c) into the paper (⊗) d) counterclockwise

ao bo co d● 6.

7. Two coils have a mutual inductance of 0.0340 H. The mutually-induced emf in coil 1 is ____________ V at t = 3.45 s, when the current through coil 1 is constant at 3.21 A and the current in coil 2 is decreasing at a rate of –5050 A/s.

a) (0.0340)(5050)(3.45) b) zero c) $0.0340\frac{3.21}{3.45}$ d) (0.0340)(5050)

ao bo co d● 7.

8. Coil 1 has 135 turns and coil 2 has 246 turns. When a constant current of 3.21 A flows in coil 1and *no* current flows in coil 2, the average magnetic flux from this 3.21 A current is 0.777 mWb through each turn of coil 1 and 0.444 mWb through each turn of coil 2. (Of course, the zero current in coil 2 gives zero magnetic flux through each turn of each coil.) Therefore, the self-inductance of coil 1 is _____ mH.

$I_1 = 3.21$ A Φ_1 .777 mWb $\Phi_2 = 0.444$ mWb

a) indeterminate b) $\frac{(135)(0.777)}{3.21}$ c) $\frac{(246)(0.444)}{3.21}$ d) $\frac{(246)(0.777)}{3.21}$

ao b● co do 8.

9. In problem 8 above, the self-inductance of coil 2 is _____ mH.

a) indeterminate b) $\frac{(135)(0.777)}{3.21}$ c) $\frac{(246)(0.444)}{3.21}$ d) $\frac{(246)(0.777)}{3.21}$

a● bo co do 9.

10. In problem 8 above, the mutual inductance of the two coils is ______ mH.

a) $\frac{(135)(0.444)}{3.21}$ b) $\frac{(135)(0.777)}{3.21}$ c) $\frac{(246)(0.444)}{3.21}$ d) $\frac{(246)(0.777)}{3.21}$

ao bo c● do 10.

11. In problem 8 above, Φ_{B1}= __________.

a) $(\Phi_B)_1$ b) Φ_{B2} c) $(\Phi_B)_2$ d) 0.777 mWb

a● bo co do 11.

12. A magnetic field of 0.12 T is in the y-direction. The velocity of wire segment S has a magnitude of 26 m/s and components of 6 m/s in the x-direction, 8 m/s in the y-direction, and 24 m/s in the z-direction. The length vector of segment S is in the z-direction and has a magnitude of 0.009 m. Thus, the motional emf induced between the ends of segment S is (__ × 0.12 × 0.009) V.

a) 24 b) 8 c) 6 d) 26

a● bo co do 12.

13. In problem 12 above, we are solving for ___.

a) ε b) $\mathcal{E}$ c) E d) Φ_E

ao bo c● do 13.

14. An inductor is a circuit element used mainly for its ___.

a) Φ_E b) R c) C d) L ao bo co do 14.

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15. Through a certain area of a dielectric $\Phi_E = (8\ \text{V}\cdot\text{m/s}^5)t^5$. Also, $i_D = 7$ nA through that area at $t = 2$ s. In this problem, $(8\ \text{V}\cdot\text{m/s}^5)t^5$ is the value of the ________________.

a) electric flux b) permittivity c) displacement current d) permeability ao bo co do 15.

16. In problem 15 above, 7 nA is the value of the ________________.

a) electric flux b) permittivity c) displacement current d) permeability ao bo co do 16.

17. In problem 15 above, $\dfrac{7\ \text{nA}}{(40\ \text{V}\cdot\text{m/s}^5)(2\ \text{s})^4}$ is the value of the ________________.

a) electric flux b) permittivity c) displacement current d) permeability ao bo co do 17.

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18. __________ law says the direction of any magnetic induction effect is such as to oppose the cause of the effect.

a) Lenz's b) Ampere's c) Cole's d) Henry's ao bo co do 18.

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19. The magnetic potential energy stored in the magnetic field of a 8 mH coil when the coil carries a constant current of 5 A is ______ mJ.

a) $\frac{1}{2}(8)(5)^2$ b) $\sqrt{\frac{(2)(8)}{5}}$ c) $-(8)\frac{d(5)}{dt} = 0$ d) $\sqrt{\frac{(2)(5)}{8}}$ ao bo co do 19.

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20. In copper (a diamagnetic material) at room temperature, μ is ________________________ μ_0.

a) slightly greater than
b) slightly less than
c) exactly equal to
d) zero times

ao bo co do 20.

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21. Seven seconds after starting to change the average magnetic flux through each turn of a 26 turn coil at a constant rate of _______ microwebers per second, the induced emf across the coil is –140 microvolts.

a) (140)(26) b) (140)(26)(7) c) $\frac{140}{26}$ d) $\frac{(140)(26)}{7}$ ao bo co do 21.

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22. A rigid circular conducting loop is at rest in the plane of the paper. An *external* magnetic field through the loop is out of the paper (⊙) and is *constant*. Therefore, the *induced* magnetic field is

a) out of the paper (⊙) b) zero c) counterclockwise d) into the paper (⊗) ao bo co do 22.

23. On the other hand, if the *external* magnetic field through the loop is out of the paper (⊙) and is *decreasing*, the *induced* magnetic field is

a) out of the paper (⊙) b) zero c) counterclockwise d) into the paper (⊗) ao bo co do 23.

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24. A current decreasing at a rate of –380 A/s induces an emf of 62 mV in a coil of self-inductance _____ mH.

a) $\frac{380}{62}$ b) $\frac{62}{380}$ c) $\frac{2(62)}{(380)^2}$ d) (380)(62) ao bo co do 24.

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25. The energy density of a 0.15 T magnetic field in vacuum is 9.0 kJ/m^3. If the magnetic field magnitude is tripled to 0.45 T, the energy density in vacuum will be ___ kJ/m^3.

a) $3 \times 9.0 = 27$ b) $\frac{9.0}{3} = 3.0$ c) $\frac{9.0}{3^2} = 1.0$ d) $3^2 \times 9.0 = 81$ ao bo co do 25.

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26. In class yesterday, we used $I = i$ to show the magnetic potential energy of an inductor equals ______________.

a) $\frac{u}{\text{volume}}$ b) $\frac{B^2}{2\mu}$ c) $\frac{1}{2}N\Phi_B i$ d) $-\frac{N\Phi_B}{i}\frac{di}{dt}$ ao bo co do 26.