PHYSICS

BOOKS - CHETANA PUBLICATION

Electromagnetic Induction

Example

1. What do you understand by electromagnetic induction?

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2. What is magnetic flux?

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3. What type of quantity is magnetic flux?

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4. What is SI unit and CGS unit of magnetic flux?

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5. How is magnetic flux represented if the magnet field is uniform?

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6. How is magnetic flux represented if the magnet field is non-uniform?

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7. When is magnetic flux linked with the coil is maximum ?

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8. When is magnetic flux linked with the coil is minimum?

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9. What isthe dimension of magnetic flux?

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10. Define magnetic flux and explain it.

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11. State Faraday's first law of electromagnetic induction.

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12. State Faraday's second law of Electromagnet induction.

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13. State Faraday's laws of electromagnetic induction.

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14. Explain how Faraday's second law of electromagnetic induction can be expressed mathematically.

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15. State the limitation of second law of electromagnetic induction.

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16. State Lenz's Law.

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17. How is Lenz's Law represented mathematically?

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18. Is Lenz's Law of EMI consistent with law of conservation of energy?

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19. State and explain Lenz'slaw of electromagnetic induction in accordance with the principle of conservation of energy

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20. Explain Lenz's Law is in accordance with conservation of energy.

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21. The magnetic flux associated with the coil changes by 16×10^{-2} Wb in 10 seconds. Find the e.m.f. induced.

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22. Find the change in magnetic flux associated with the coil in 15 seconds, if the induced e.m.f. in the coil is $2 \times 10^{-3} V$.

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23. The flux in a closed circuit of resistance 50Ω varies with time according to the equation $\phi = t^2 + 2t - 5wb$. What is the induced current in1s?

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24. . The magnetic flux through a loop of resistance 0.1Ω is varying according to the relation $\phi = 6t^2 + 7t + 1$, where Ω isin milliweber and t is in second. What isthe

e.m.f.induced in the loop at t =1s and the magnitude of the current?

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25. A wire 88 cm long bent into a circular loop is kept with plane of the coil perpendicular to the magnetic induction $2.5Wb/m^2$. Within 0.5 second, the coil is changed to a square and magnetic induction is increased by $0.5Wb/m^2$. Calculate the e.m.f. induced in the wire.

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26. Explain the concept of magnetic flux.

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27. A loop of wire is placed in a magnetic field B = $0.5\hat{i}T$. If the area of the loop is $\overrightarrow{A}$ = $\left(3\hat{i}+6\hat{j}+5\hat{k}\right)m^2$, then what isthe, angle between $\overrightarrow{A}$ and $\overrightarrow{B}$.

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28. State the expression for the maximum induced emf in case of translational motion of a conductor in a uniform magnetic field

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29. Find the expression for the motional emf induced when a charge q which is carried along by the moving wire in a uniform magnetic field experiences force

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30. Derive an expression for induced emf due to translational.

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31. Derive an expression when a part of motion of conductor frame of wire is kept is an uniform magnetic field, is moved.

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32. Does Flux Rule hold true for the stationary wire loop kept in a changing magnetic field? Why?

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33. Derive an expression for motional emf in a rotating bar.

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34. A cycle wheel with 10 spokes each of length 0.5 m long is rotated at a speed of $18km/hr$ in a plane normal to the earth's magnetic induction of $3.6 \times 10^{-5}T$. Calculate the e.m.f. induced between the axle and rim of the cycle wheel

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35. A cycle wheel with 10 spokes each of length 0.5 m long is rotated at a speed of $18km/hr$

in a plane normal to the earth's magnetic induction of $3.6 \times 10^{-5} T$. Calculate the e.m.f. induced between the ends of single spoke and ten spokes.

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36. An aircraftof wingspanof 50 m flieshorizontally in earth's magnetic field of 6×10^{-5} T at a speed of $400 m / s$. Calculate the emf generated between the tips of the wing of aircarft.

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37. A conductor of length 0.3 m moves with a uniform velocity of $10m/s$ at right angles to the magnetic field of induction $0.5 \times 10^{-4} Wb/m^2$. Calculate the e.m.f. induced in it.

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38. A metal rod of length 1 m is rotated about one of its endsin a plane at right anglesto a

uniform magnetic field of induction $2.5 \times 10^{-3} Wb/m^2$. If it makes 1800 r.p.m. calculate the induced emf between it.

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39. Calculate the value of induced emf between the ends of an axle of a railway carriage 1.75 m long travelling on a level ground with a uniform velocity of $50 Km/hr$. The vertical component of Earth's magnetic field (B_v) is given to be $5 \times 10^{-5} T$.

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40. The conductor moving with uniform velocity of $10m/s$ at right angles to the magnetic field of induction $0.4 \times 10^{-4} Wb/m^2$. Calculate length of the conductor if the e.m.f. induced at the ends of conductor is $6 \times 10^{-5} V$.

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41. A metal disc is made tospin at 20 revolutions per second about an axis passing through its centre and normal to its plane.The disc has a radius of 30 cm and spinsin a uniform magnetic field of 0.20 T, which is parallel to the axis of ratation. Calculate :The area swept out per second by the radius of the disc.

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42. A metal disc is made tospin at 20 revolutions per second about an axis passing through its centre and normal to its plane.The disc has a radius of 30 cm and spinsin a uniform magnetic field of 0.20 T, which is parallel to the axis of ratation. Calculate :The flux cut per second by a radius of the disc.

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43. A metal disc is made tospin at 20 revolutions per second about an axis passing through its centre and normal to its plane.The disc has a radius of 30 cm and spinsin a uniform magnetic field of 0.20 T, which is parallel to the axis of ratation. Calculate: The induced emf in the disc

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44. Explain with help of graph how emf isinduced in the magnet coil system?

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45. Describe the magnet coil experiment to give the value of peak emf induced.

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46. A coil cosists of 400 turns of wire. Each turn is a square of side d= 20 cm. A uniform magnetic field directed perpendicular to the plane of the coil is turned on. If the field changes linearly from 0 to 0.50 T in 0.8 s, what is the magnitude of induced emf in the coil while is the field is changing?

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47. What are generators.

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48. Define AC Generator.

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49. Give the schematic of a generator and the working

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50. Why the emf generated in ac generated is AC? Explain the graph of current v / s time.

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51. How an ac generator charges a storage battery?

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52. A coil of 100 turns each of area 0.1 m^2 is rotated at constant speed of 300 r.p.m. in a uniform magnetic field of induction 0.02 Wb/m^2 about an axis in the plane of the coil and perpendicular to the direction of the coil.Calculate the maximum value of induced e.m.f.

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53. A coil of 10^3 turns each of area $100cm^2$ rotateswith speed of 100 r.p.m. about an axis in its plane and perpendicular to uniform field of induction $36 \times 10^{-2} Wb/m^2$. Find the peak and e.m.f. value of the induced e.m.f. in the coil.

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54. In an A.C. generator, the coil has an area 300 cm^2 and 25 turns rotates with an angular

speed of $40 rad/s$. The magnetic induction is 0.05 T. Obtain the maximum and peak value of voltage generated in it.

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55. How is emf generated in: A battery.

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56. How is emf generated in: Piezoelectric crystals.

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57. How is emf generated in: Thermocouple.

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58. How is emf generated in: Photo electric cell.

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59. How is emf generated in: Van de Graft generator.

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60. How is emf generated in: Genertor.

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61. What is back emf?

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62. Is the back emf constant or variable? Explain

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63. Is there any back emf in a generator?

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64. Is there any back emf in a generator?

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65. What is back torque?

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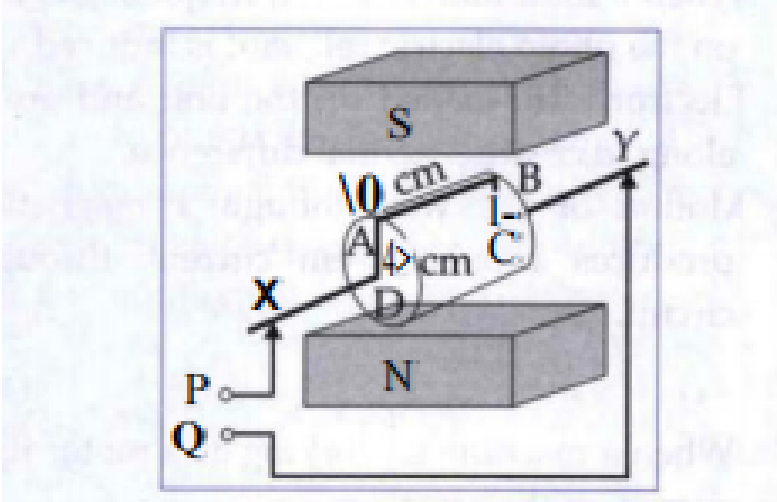
66. A rotating armature of a simple generator consists of a loop ABCD to which connections are made through sliding contacts.The armature is rotated at 1500 rpm in the magnetic field $\left(\vec{B}\right)$ of$0.5N/A.m.$

Determine the induced emf between the terminals P and Q of the generator at the instant shown in the adjoining figure.



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67. A conducting loop of area $1m^2$ is placed normal to uniform magnetic field $3Wb/m^2$. If

the magnetic field is uniformly reduced to $1Wb/m^2$ in a time of 0.5 s, calculate the induced emf produced in the loop.

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68. A search coil having 2000 turns with area $1.5cm^2$ is placed in a magnetic field of 0.60T. The coil is moved rapidly out of the field in a time of 0.2 second.Calculate the induced emf across the search coil.

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69. A stiff semi-circular wire of radius R is rotated in a uniform magnetic field B about an axis passing through its ends. If the frequency of rotation of wire be f, calculate the amplitude of alternating emf induced in the wire.

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70. A uniform magnetic field B(f), pointing upward fills a circular region of radius, s in

horizontal plane. If B is changing with time, find the induced electric field

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71. Derive an expression for rate of doing work on the loop in an external magnetic force.

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72. Derive an expression for power generated or rate of generation of heat for a loop moved

in external magnetic field.

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73. What are eddy currents?

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74. Give the experiment to demonstrate the formation of eddy currents in a conductor.

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75. Why cores of transformer are made of thin metal strip?

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76. Explain various applications of eddy currents with qualitative explanation.

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77. State the disadvantages of eddy currents and how to minimise these disadvantages.

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78. If a magnet is dropped through a long thick walled vertical copper tube, the magnet attains constant velocity after some time. Explain.

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79. If a copper disc swings between the poles of a magnet, the pendulum comes to rest very quickly. Explain the reason. What happens to the mechanical energy of the pendulum?

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80. Define self induction and derive formula for self induced e.m.f. in the coil due to self induction.

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81. Define self inductance or coefficient of self induction state its units and dimensions?

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82. The current in the coil decreasesfrom10 Amp to 5 Amp in 0.1second. Calculate the co-efficient of self-inductance if induced e.m.f.is 5 V.

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83. A coil having 100 turns carrying current of 2 mA has self-inductance 10 mH. Find the magnetic flux linked with each turn of the coil

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84. Discuss self inductance as analogue to mass in mechanical motion.

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85. Derive an expression for inductance of a solenoid and state factors on which it depends.

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86. Explain why the inductance of two coils connected in parallel is less than the inductance of either coil.

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87. The self inductance of a closely wound coil of 200 turns is 10 mH . Determine the value of magnetic flux through the cross -section of the coil when the current passing through the coil is 4 mA.

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88. Derive an expression for the self-inductance of a toroid of circular crosssection of radius r and major radius R. Calculate the self inductance (L) of toroid for major

radius(R) = 15 cm, cross section of toroid having radius (r) = 2.0 cm and the number of turns (n) = 1200.

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89. Consider a uniformly wound solenoid having N turns and length L. The core of the solenoid is air. Find the inductance of the solenoid of N = 200, L = 20 cm and cross-sectional area, A = $5cm^2$. Calculate the induced

emf e_L, if the current flowing through the solenoid decreases at a rate of $60A/s$.

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90. Derive an expression for energy stored in a magnetic field.

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91. Discuss the analogy between energy stored in the electric field of the capacitor and the

energy stored in the magnetic field in the inductor.

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92. Calculate the self-inductance of a coaxial cable of length l and carrying a current I.The current flows down the inner cylinder with radius a, and flows out of the outer cylinder with radius b.

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93. Derive an expression for energy density of a magnetic field?

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94. Define mutual inductance. Derive formula for the induced e.m.f. in the coil due to mutual inductance.

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95. Define Mutual inductance or coefficient of mutual induction? State the units and dimensions of M.

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96. State the factors on which self inductance and mutual inductance depends.

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97. Distinguish between Self Inductance and Mutual Inductance.

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98. A pair of adjacent coils has a mutual inductance of 1.5H. If the current in one coil changes from 0 to 10 A in 0.2s, what is is the change of flux linkage with the other coil?

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99. A long solenoid consisting of $1.5 \times 10^3 turns/m$ has an area of cross-section of $25cm^2$. A coil C, consisting of 150 turns (N_c) is wound tightly around the centre of the solenoid. Calculate for a current of 3.0 A in the solenoid (a) the magnetic flux density at the centre of the solenoid, (b) the flux linkage in the coil C, (c) the average emf induced in coil C if the current in the solenoid is reversed in direction in a time of 0.5 s. $(\mu 0 = 4\pi \times 10^{-7} T.m/A)$.

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100. The value of mutual inductance of two coils is B 10 mH. If the current in one of the coil changes from 5A to 1A in 0.2 s, calculate the value of emf induced in the other coil. Also calculate the value of induced charge passing through thecoil if its resistance is 5 ohm.

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101. An emf of $96.0mV$ is induced in the windings of a coil when the current in a

nearby coil is increasing at the rate of $1.20\frac{A}{s}$. What is the mutual inductance (M) of the two coils ?

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102. A long solenoid of length l, crosssectional area A and having N_1 turns(primary coil), has a small coil of N_2 turns (secondary coil) wound about its centre. Determine the Mutual inductance (M) of the two coils.

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103. A toroidal ring, made from a bar of length (l) 1 m and diameter (d) 1 cm, is bent into a circle. It is wound tightly with 100 turns per cm. If the permeability of bar is equal to that of free space (μ_0), calculate the magnetic field inside the bar (B) when the current (*) circulating through the turns is 100 A. Also determine the self inductance (L) of the coil.

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104. Flux associated with second coil having 1000turns changes by6×10^{-4} Wb per turn due to change in current of 3 A in one coil. Find the mutual inductance of pair of coil

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105. What is coefficient of coupling (K)?

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106. The primary and secondary coils of a transformer each have an inductance of $200 \times 10^{-6} H$.The mutual inductance (M) between the windings is $4 \times 10^{-6} H$. What percentage of the flux from one coil reaches the other?

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107. How does coefficient of mutual induction depend upon coefficient of coupling?

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108. Two coils having self inductance $L_1 = 75mH$ and $L_2 = 55mH$ are coupled with each other. The coefficient of coupling (K) is 0.75. Calculate the mutual inductance (M) of the two coils.

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109. What is a transformer?

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110. State the principle of workingof transformer?

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111. Which device uses the principle of mutual inductance?

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112. What is turns ratio of a transformer? What can you say about its value for 1 step- up transformer 2) step down transformer?

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113. State any two factors on which the maximum value of alternating e.m.f induced in the secondary coil of a transformer depends.

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114. Explain the construction and working of a transformer. Derive an expression for ratio of emfs in terms of number of turns in primary and secondary coil (march 14,16 july 17).

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115. What is step-up and step-down transformer?

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116. State main applications of transformer.

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117. The primary coil of a transformer has 100 turns and the secondary coil has 300 turns. If the peak value of the alternating emf applied to the primary coil 150v, what is the peakvalue of the alternating emf obtained across the secondary coil?

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118. The primary of a transformer has 40 turns and works on 100 volt and 100 watt.Find the number of turns in the secondary to step up voltage to 400 V. Also calculate the current in the secondary and primary.

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119. The transformer ratio of the step down transformer is $2:5$. Alternating voltage of 180 V amplitude is supplied to the primary. Calculate the r.m.s. value of secondary voltage

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120. A transformer decreases the alternating supply voltage from 2200 V to 220 V. If the number of turns in the primary coil of the transformer is 2000, calculate the number of turns in secondary.

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121. In a transformer the number of turns in primary and secondary are 500, 2500 turns, respectively. If the power input to primary is 80×10^{-3} W at 240 V, calculate output voltage.

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122. In a transformer the number of turns in primary and secondary are 500, 2500 turns, respectively. If the power input to primary is

80×10^{-3} W at 241 V, calculate : current in primary.

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123. A current 10 A in the primary of a transformer is reduced to zero at the uniform rate of 0.1 second. If the co-efficient of mutual inductance is 3H, what isthe e.m.f. induced in the secondary and change in the magnetic flux per turn in the secondary if it has 50 turns?

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124. Distinguish between step-up and step-down.

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Exercise

1. A magnetic flux associated with a coil changes by 5×10^{-2} Wb in 25 second. Find the emf induced in the coil.

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2. The current in one coil increasesfrom0 to 500 mA in 0.1 ms. The induced emf in the second coil is 500 V. Calculate the mutual inductance between the two coils.

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3. An emf of 100 mV is induced in a conductor of length 1.2m when it moves with a uniform

velocity of $30m/s$ at right angles to a uniform magnetic field. Find the magnetic induction.

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4. The current increases at the rate of $10As^{-1}$ in the coil of inductance of 1.26×10^{-3} H. Calculate the magnitude of self induced emf

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5. The current in a coil changes from zero to 5A in 0.2 seconds, due to which an induced emf of 20V is induced.Calculate the coefficient of self induction.

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6. The mutual inductance between the two coils is 2×10^{-2}H.Due to the change of current in first coil, an e.m.f. of 1.0×10^{-2} V is

induced in the second coil. Find the rate of change of current in the first coil

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7. A step down transformer, connected to mains supply 240V is made to operate a 12V 36W lamp. Assume 100% efficiency. Estimate current in the primary circuits.

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8. The primary winding of a transformer has 300 turns and its secondary winding has 60. If the current in the secondary winding is 40A, find the current in the primary winding.

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9. A coil of effective area $10m^2$ is placed at right angles to a magnetic field of induction 0.05 T. Find the induced emf in the coil if just

the magnitude of the field is changed to 0.03T in 0.2s.

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10. The current increases at the rate of $10As^{-1}$ in the coil of inductance of 1.26×10^{-3} H. Calculate the magnitude of self induced emf

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11. A coil of effective area $4m^2$ is placed at right angles to a magnetic field of induction $0.05Wb/m^2$. If the field is decreased to 20% of its original value in10 seconds, find the e.m.f. induced in the coil.

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12. A rectangular coil $(0.5m \times 0.4m)$ has a resistance of 5Ω . The coil is placed in a uniform magnetic induction of 0.05 T

perpendicular to the place of the coil. If the magnetic induction is uniformly reduced to zero in $5 \times 10^{-3} s$, find the e.m.f

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13. A rectangular coil $(0.5m \times 0.4m)$ has a resistance of 5Ω . The coil is placed in a uniform magnetic induction of 0.05 T perpendicular to the place of the coil. If the magnetic induction is uniformly reduced to

zero in $5 \times 10^{-3} s$, find the current induced in the coil

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14. A coil of area $0.75 m^2$ and 1000 turns is kept perpendicular to a magnetic field of $0.15 Wb/m^2$. Calculate the change in magnetic flux through the coil when it isrotated through an angle of 30° about a diameter.If the time taken for the rotation

is0.5s.What is the average value of e.m.f.induced in the coil?

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15. Find the self-inductance of a circuit in which an e.m.f. of 10V is induced when the current in the circuit changes uniformly from1A to0.5A in 0.2s.

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16. The mutual inductance of a pair of coils is 0.75H. If the current in the primary coil changes from 0.5A to zero in 0.01s, find the average induced e.m.f. in the secondary.

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17. A step down transformer has 800 turns in the primary. The supply voltage is 240 V. If the transformer is to be used to light a 6V lamp,

what should be the number of turns in the secondary?

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18. A coil of effective area $2m^2$ is placed at right angles to a magnetic field of induction $0.08Wb/m^2$. Find the e.m.f. induced in it if the field reduces to ten percent of its original value in 0.6s

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19. The back e.m.f. induced in an inductive coil is 100 V when the current in the coil changes uniformly from zero to10A in 0.01s. Find the self-inductance of the coil.

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20. The coefficient of mutual inductance between a pair of coils is 5mH. Find the e.m.f.induced in one coil when the current in the other coil changes at the rate of $250A/s$.

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21. The magnetic flux through a closed circuit is ϕ= 15t-t+5 Weber. If the resistance of the circuit is 10Ω, calculate the magnitude of the current induced in 0.2 sec.

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22. The magnetic flux through a spark coil of 1000 turn changes from 1.0 Wb to zero wb in `1/10sec. Determine the emf induced in the coil.

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23. Magnetic flux in a closed circuit of resistance 20Ω varies with time tin accordance with equation $\phi = 6t^2 - 5t + 1$. Find the magnitude of induced current at t=0.25 sec.

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24. A square coil having500 turnseach of side10cm is placed normal to the magneticflux

which increases of the rate of $1.0T/s$. What is the e.m.f. induced.

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25. The current in one coil increases from 0 mA to 500 mA in 0.1 ms. The emf induced in the second coil is 500V. Calculate the mutual inductance between the coil.

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26. The current increases at the rate of $10As^{-1}$ in the coil of inductance of 1.26×10^{-3} H. Calculate the magnitude of self induced emf

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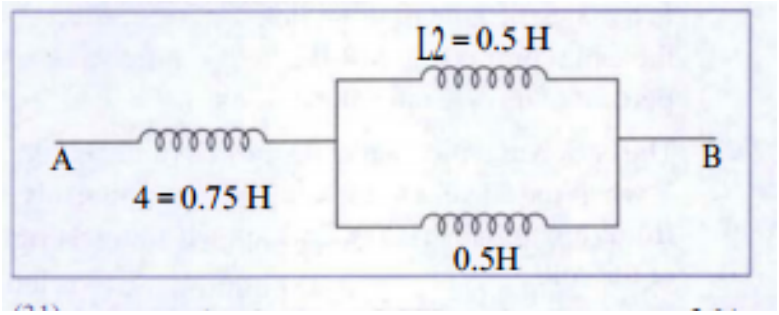
27. Calculate the inductance of three inductors connected as shown:



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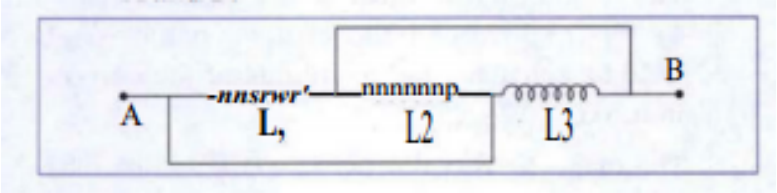
28. Three inductors each of 6.0 H are connected as shown. Whatis theequivalent inductance between A and B:



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29. A circular coil of 100 turns with a crosssectional area (A) of $1m^2$is kept with its plane perpendicular to the magnetic field (B) of 1 T.What is the magnetic flux linkage with the coil?

A. 1WB

B. 100WB

C. 50WB

D. 200WB

Answer:

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30. A conductor rod of length (l)is moving with velocity (v)in a direction normal to a uniform magnetic field (B).What will be the magnitude of induced emf produced between the ends of the moving conductor?

A. BLv

B. BLv2

C. $\frac{1}{2}Blv$

D. $\frac{\mu Bl}{v}$

Answer:

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31. Two inductor coils with inductances 10 mH and 20 mH are connected in series .What is the resultant inductance of the combination of the two coils?

A. 20mH

B. 30mH

C. 10mH

D. $\frac{20}{3}mH$

Answer:

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32. A current through a coil of self inductance 10 mH increases from 0 to 1 A in 0.1 s. What is the induced emf in the coil?

A. 0.1V

B. 1V

C. 10V

D. 0.01V

Answer:

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33. What is a energy required to build up a current of 1 A in an inductor of 20 mH?

A. 10mj

B. 20mj

C. 20j

D. 10j

Answer:

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34. Lenz's law of consequence of the law of conservation of?

A. charge

B. momentum

C. mass

D. energy

Answer:

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35. A cylindrical bar magnet is kept along the axis of a circular coil. If the magnet is rotated about its axis, the

A. current will be induced in a coil.

B. no current will be induced in a coil

C. only e.m.f. will be induced in the coil

D. e.m.f. and current both will be induced in the coil.

Answer:

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36. A magnet is brought towards a coil (i) speedily (ii) slowly, then the induced e.m.f./induce charge will be respectively

A. more in first case/more in first case

B. more in first case/equal in both case

C. less in first case/more in second case

D. less in first case/equal in both case

Answer:

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37. A square coil having500 turnseach of side10cm is placed normal to the magneticflux which increases of the rate of $1.0T/s$. What is the e.m.f. induced.

A. 0.1

B. 0.5

C. 1

D. 5

Answer:

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38. A coil having an area $2m^2$ is placed in a magnetic field which changes from $1wb/m^2$ to $4wb/m^2$ in an interval of 2 second. The e.m.f. induced in the coil will be

A. 4V

B. 3V

C. 1.5V

D. 2V

Answer:

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39. In a circuit with a coil of resistance 2 ohms, the magnetic flux changes from 2.0 wb to 10.0 wb in 0.2 second. The charge that flows in the coil during this time is

A. 5.0coulomb

B. 4.0coulomb

C. 1.0coulomb

D. 0.8coulomb

Answer:

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40. A rectangular coil of 20 turns and area of cross section 25 sqcm has a resistance of 100 ohm. If a magnetic field which is perpendicular to the plane of the coil changes of the rate of 1000 tesla per second, the current in the coil is?

A. 1.0ampere

B. 50ampere

C. 0.5ampere

D. 5.0ampere

Answer:

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41. The magnetic flux linked with a coil, in webers is given by the equations ϕ =

$3t^2 + 4t + 9$. Then the magnitude of induced e.m.f. at t =2 second will be

A. 2 volt

B. 4 volt

C. 8 volt

D. 16 volt

Answer:

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42. A coil has an area of $0.05m^2$ and it has 800 turns. It is placed perpendicularly in a magnetic field of strength $4 \times 10^{-5} wb/m^2$, it is rotated through 90° in 0.1 sec. The average e.m.f. induced in the coil is

A. 0.056V

B. 0.046V

C. 0.026V

D. 0/016V

Answer:

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43. A 10 metre wire kept in east-west direction is falling with velocity $5m/\sec$ perpendicular to the field $0.3 \times 10^{-4} wb/m^2$. The induced e.m.f. across the terminal will be

A. 0.15V

B. 1.5mV

C. 1.5V

D. 15.0V

Answer:

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44. A metal conductor of length 1m rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4} T$, then the e.m.f. developed between the two ends of the conductor is

A. 5mV

B. $5 \times 10^{-4} V$

C. 50mV

D. $50 \mu V$

Answer:

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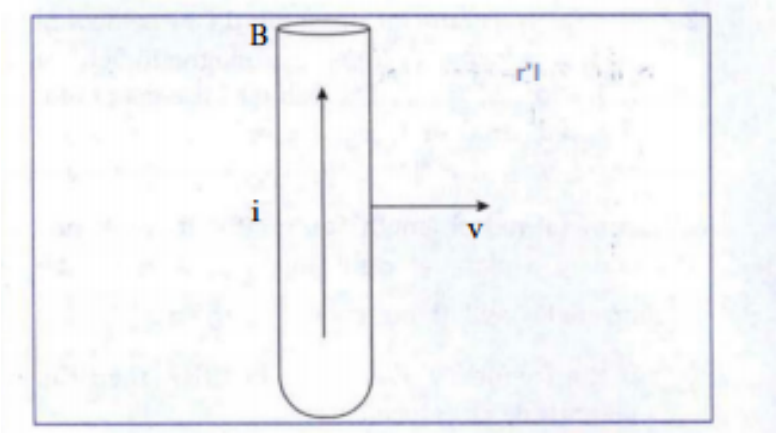
45. A conducting wire is moving towards right in a magneticfield B.The direction of induced current in the wire is shown in the figure. The

direction of magnetic field will be:



A. in the plane of paper pointing towards right

B. in the plane of paper pointing towards left

C. perpendicular to the plane of paper and down wards

D. perpendicular to the plane of paper and up wards

Answer:

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46. An e.m.f. of 5 volt is produced by a self inductance, when the current changes of a steady rate from 3A to 2A in1 millisecond. The value of self inductance is

A. zero

B. 5H

C. 5000H

D. 5mH

Answer:

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47. A 50 mH coil carries a current of 2 ampere.

The energy stored in joules is

A. 1

B. 0.1

C. 0.05

D. 0.5

Answer:

Watch Video Solution

48. The current passing through a choke coil of 5 Henry is decreasing at the rate of

$2A/\sec$. The e.m.f. developing across the coil is

A. 10V

B. $-10V$

C. 2.5V

D. $-2.5V$

Answer:

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49. In what form is the energy stored in an inductor

A. magnetic

B. electrical

C. both magnetic and electrical

D. heat

Answer:

 Watch Video Solution

50. The average e.m.f. induced in a coil in which the current changes from 2 ampere to 4 ampere in 0.05 second is 8 volt. What is the self inductance of the coil?

A. 0.1H

B. 0.2H

C. 0.4H

D. 0.8H

Answer:

51. Two pure inductors each of self inductance L are connected in parallel but are well separated from each other. The total inductance is

A. 2L

B. L

C. $\frac{L}{2}$

D. $\frac{L}{4}$

Answer:

Watch Video Solution

52. The self inductance of a coil is 5 H, a current of 1 A change to 2 A within 5 second through the coil. The value of induced e.m.f. will be

A. 10 volt

B. 0.10volt

C. 1.0volt

D. 100volt

Answer:

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53. A straight conductor of length 0.4 m is moving with a velocity of $7m/s$, in a magnetic field of induction $2Wb/m^2$. The value of the maximum induced e.m.f. in the conductor is

A. 2V

B. 3V

C. 5.6V

D. 2.8V

Answer:

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54. A metal rod of length lm, rotates about its one end in a plane at right angles to a horizontal magnetic field of induction $\frac{7}{22} \times 10^{-4} T$If the frequency of rotation is 10Hz, then the magnitude of induced emf is

A. 0.5mV

B. 1mV

C. 0.5V

D. 1V

Answer:

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55. The magnetic flux through a coil is 5×10^{-4} Wb at time t = 0. It reduces to ten percent of its original value in 0.5s. The magnitude of e.m.f. induced in the coil is

A. 0.9mV

B. 0.45mV

C. 2mV

D. 5mV

Answer:

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56. Dimensional formula of magnetic flux is

A. $(\varphi) = \left[M^2 L^1 T^{-2} A^{-1}\right]$

B. $(\varphi) = \left[M^2 L^{-1} T^2 A^1\right]$

C. $(\varphi) = \left[M^2 L^2 T^{-2} A^{-1}\right]$

D. $(\varphi) = \left[M^1 L^2 T^2 A^{-1}\right]$

Answer:

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57. A magnetic field of $2 \times 10^{-2} Wb/m^2$ actsat the right angles to a coil of area $100 cm^2$ with 50 turns. The average e.m.f. induced in the coil

is 0.1 V, when it is removed from the field in t sec, what is the value of t?

A. 1sec

B. 0.5sec

C. 0.1sec

D. 0.01sec

Answer:

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58. A rectangular coil of 25 turns, area of $25cm^2$ and resistance of $4ohm/turn$ is placed perpendicular to a varying magnetic field, which changes at the rate of $500T/s$. The induced current in the coil is

A. 0.3125 A

B. 0.3225 A

C. 31.25A

D. 3.225A

Answer:

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59. The magnetic flux in a coil is $\phi = 4t^2 + 4t + 4$. What is the magnitude of induced e.m.f. at t = 3sec?

A. 14V

B. 28 V

C. 7 V

D. 35 V

Answer:

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60. A rod of length l is rotated about its one end, perpendicular to a magnetic field of induction B What is the e.m.f induced in the rod

A. $Bl^2\omega$

B. $0.5Bl^2\omega$

C. $Bl\omega$

D. $0.5Bl\omega$

Answer:

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61. A conducting circular loop is placed in a uniform magnetic field B = 0.025 T with its place perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of $1mms^{-1}$. What is the induced e.m.f. when the radius is 2cm?

A. $2\pi\mu V$

B. $\frac{\pi}{2}\mu v$

C. $\pi\mu V$

D. $2\mu V$

Answer:

Watch Video Solution

62. A 100 mH coil carries 1 A current .Energy stored in its magnetic field is

A. 0.5 j

B. 0.1 j

C. 0.05 j

D. 0.1 j

Answer:

 Watch Video Solution

63. The current in a coil changes from 0 to 20 A in 0.5S. If the induced emf is 80V, the self inductance of the coil is

A. 2.5 H

B. 2 H

C. 1.5 H

D. 1 H

Answer:

 Watch Video Solution

64. Which one of the following is the unit of self inductance of a coil?

A. $vo <^{-1} A^{-1}$

B. $vo <^{-1} A$

C. $vo < \sec A^{-1}$

D. $vo <^{-1} A6 - 1\sec$

Answer:

Watch Video Solution

65. If L is the inductance and R is the resistance, then the unit of -$\frac{L}{R}$ is

A. ampere

B. volt

C. per sec

D. sec

Answer:

Watch Video Solution

66. The self inductance L of a solenoid of length l and area of cross-section A, with a fixed number of turns N increases as

A. l andA increases

B. l decreases and A increases

C. l increases and A decreases

D. both l and A decreases

Answer:

Watch Video Solution

67. Which one of the following units denotes the dimensions ML^2/Q^2, where Q denotes the electric charge?

A. `h//m^2

B. Weber(wb)

C. $Wb/^{m}2$

D. Henry(H)

Answer:

Watch Video Solution

68. What is the dimensional formula for the coefficient of self induction?

A. [L]=$\left[M^1L^2T^2\right]$

B. [L]=$\left[M^1L^2T^{-3}a^1\right]$

C. [L]=$\left[M^1L^2T^{-2}A^2\right]$

D. [L]=$\left[M^0L^1T^{-2}A^{-3}\right]$

Answer:

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69. A coil is wound on a frame of rectangular crosssection. If all the linear dimensions of the frameare increased by a factor 2 and the

number ofturns per unit length of the coil remains the same,then the self-inductance of the coil will increaseby a factor o

A. 16

B. 12

C. 4

D. 8

Answer:

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70. A metal plate is getting heated. It can be because Which is the wrong option from the above given statements?

A. a direct current is passing through the plated

B. it is placed in a time varying magnetic field but does not vary with time

C. it is placed in a space varying magnetic field but does not vary with time

D. a current (either direct or alternating) is passing through the plate

Answer:

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71. In a step up transformer, the input voltage is 300 V and the output voltage is 15 kV. Then the ratio of the number of turns in the primary to that in the secondary is

A. $1:20$

B. $1:30$

C. $1:40$

D. $1:50$

Answer:

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72. A step down transformer works on 220 volts a.c. mains. It is used to light at 100W, 20V

bulb. The main current is 0.5A. What is the efficiency of the transformer?

A. 0.91

B. 0.8

C. 0.71

D. 0.51

Answer:

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73. A transformer has 250 volts applied to the primary and gives 4.6V in the secondary. The secondary is connected to a load which draws a current of 5A. The current in the primary is

A. 1A

B. 0.1A

C. 2A

D. 10A

Answer:

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74. The number of turns in the primary and secondary coils of a transformer are 200 and 800 respectively. If the voltage developed across the secondary is 240V, then the potential difference across each turn of the primary will be

A. $0.1V/turn$

B. $0.2V/turn$

C. $0.3V/turn$

D. $0.5V / turn$

Answer:

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75. In relation to a transformer, the relation $\frac{n_p}{n_s}$ = 20, indicate that

A. thesecondary voltageis20 times the primary voltage

B. the primary currentis20 times thesecondary current

C. there are 20 turns in the primary and only one turn in the secondary.

D. for every 20 turns in the primary there is only one turn in the secondary.

Answer:

Watch Video Solution

76. In an ideal transformer, the number of turns in the primary is 120 and that in the secondary is 240. What is the secondary current if the primary current is 6A

A. 1.5A

B. 3A

C. 4A

D. 5A

Answer:

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77. A transformer is used to reduce the mains supplyof 220V to 22V.If the currents in the primary and secondary are 2A and 15A respectively, then the efficiency of the transformer is

A. 0.65

B. 0.75

C. 0.8

D. 0.9

Answer:

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78. The core of a transformer is laminated

A. to increase the secondary voltage

B. to reduce the eddy current losses

C. to givestrength and to increase the life of the core

D. to avoid the short circulating between the primary and secondary windings

Answer:

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79. A step down transformer of efficiency 80% is used on a 1000V line to deliver a current of 20A at 120V at the secondary coil. What is the current drawn from the line?

A. 0.3A

B. 30A

C. 2.4A

D. 3A

Answer:

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80. Henry is equivalent to

A. $ampere / \sec ond$

B. ampere-second

C. $ohm / \sec ond$

D. ohm-second

Answer:

Watch Video Solution

81. The primary winding of transformer has 200 turns and its secondary winding has 50 turns. If the current in the secondary winding is 40 A, the current in the primary is

A. 8000A

B. 80A

C. 160A

D. 10A

Answer:

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82. A transformer is used to reduce the main supply of 220 V to11 V. If the current in the

primary and secondary coils are 5A and 90 A respectively, the efficiency of transformer is

A. 0.6

B. 0.75

C. 0.4

D. 0.9

Answer:

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83. The ratio of the turns in the primary and secondary coils of transformer is1: 9. The ratio of the current in the primary to secondary is

A. $9:1$

B. $3:1$

C. $1:1$

D. $1:9$

Answer:

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84. A current in one coil changes from 5 A to 3 A in 0.2 sec and the co-efficient of mutual inductance of second coil is 10 mH. The e.m.f. induced in the 2nd coil is

A. 0.01V

B. 0.1V

C. 0.001V

D. 10V

Answer:

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85. The current in the coil changes from 3A to 6 A in 3sec. If the induced e.m.f. in the coil is 60 V, then self inductance of the coil is

A. 6H

B. 60H

C. 0.6H

D. 600H

Answer:

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86. If south pole of the magnet is moved towards the coil then the nearer face of the coil behaves like a

A. South-pole

B. North-pole

C. Positive charge

D. Negative charge

Answer:

Watch Video Solution

87. The current in the choke coil decreasing at the rate of $3A/s$ and choke coil has inductance 3 H. Then induced e.m.f. across coil is

A. $+9V$

B. $-9V$

C. 0.3V

D. $+10V$

Answer:

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88. The phenomenon of producing an induced e.m.f. in a conductor due to the changing magnetic flux is

A. heating effect

B. magnetic effect of an electric current

C. electromagnetic induction

D. thermal effect

Answer:

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89. Faraday's laws of electromagnetic induction is related to

A. law of conservation of charge

B. law of conservation of momentum

C. law of conservation of energy

D. gravitational law

Answer:

Watch Video Solution

90. To induce an e.m.f. in a coil, the magnetic flux

A. must increase

B. must decrease

C. remains constant

D. can increase or decrease

Answer:

Watch Video Solution

91. The co-efficient of self induction of a coil is the ratio of

A. e.m.f. induced to the rate of change of current in the coil

B. e.m.f. induced to the current in the coil

C. current in the coil to the e.m.f. induced

D. rate of change of current in the coil to the e.m.f. induced.

Answer:

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92. The S.I. unit of inductance Henry can be written as

A. ampere

B. ohm second

C. weber//ampere

D. all of these

Answer:

Watch Video Solution

93. The number of turns in primary and secondary coil of transformer are 1000 to 5000 and 90 V ac is applied to primary, hence the voltage at the secondary is

A. 90V

B. 450V

C. $\frac{90}{5}V$

D. $\frac{90}{25}V$

Answer:

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94. Lenz's law is in accordance with law of conservation of

A. Energy

B. Charge

C. current

D. Potential

Answer:

Watch Video Solution

95. Magnetic flux associated with area element ds kept in magnetic induction B is given by

A. $\overline{B}.\overline{ds}$

B. $\overline{I}\ (\overline{ds})$

C. $\overline{B}.\overline{ds}$

D. $\overline{I}\left(\overrightarrow{ds}\right)$

Answer:

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96. Induced e.m.f. produced in the coil is 4mV. What is the change in flux associated with the coil in 100 seconds?

A. 5Wb

B. 0.03Wb

C. 0.4Wb

D. 0.2Wb

Answer:

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97. Foucault's current is also

A. alternatind current

B. r.m.s.current

C. peak current

D. eddy currents

Answer:

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98. What is SI unit of magnetic flux density?

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99. Why induced emf is called back emf?

Watch Video Solution

100. What is SI unit of self inductance?

Watch Video Solution

101. Write a short note on generator.

Watch Video Solution

102. State Faraday's laws of electromagnetic induction.

Watch Video Solution

103. A straight conductor is moving with a velocity of $18km/hr$ at right angles to magnetic field at induction $3.6 \times 10^{-5}T$. Find length at conductor if e.m.f. developed at its end is $45 \times 10^{-5}V$.

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104. The primary of transformer has 5000 turns and works on 400V and 100 Walt. Find the number of turns in the secondary to step down voltage to 100V.

105. Define mutual induction state its unit and dimension

106. What are eddy currents? State applications of eddy currents?

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107. Explain why the inductance of two coils connected in parallel is less than the inductance of either coil.

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108. The value of mutual inductance of two coils is B 10 mH. If the current in one of the coil changes from 5A to 1A in 0.2 s, calculate the value of emf induced in the other coil. Also calculate the value of induced charge passing through thecoil if its resistance is 5 ohm.

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109. Derive the expression for self inductance of a solenoid.

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