QUESTIONS FROM COMPETITIVE EXAMS

6.1 Magnetic Flux of Field

(MHT-CET 2001)

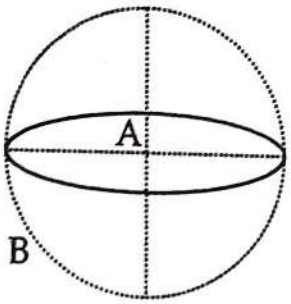
Dimensions of magnetic flux are

a) $[M^1 L^2 T^{-2} A^1]$ b) $[M^1 L^1 T^{-2} A^{-1}]$ c) $[M^1 L^1 T^{-2} A^1]$ d) $[M^1 L^2 T^{-2} A^{-1}]$

6.2 Faraday's Experiments of Electromagnetic Induction

(MHT-CET 2021)

Two coils of wires A and B are placed mutually perpendicular as shown. When current is changed in any one coil.



a) no current will be induced in the other coil.

b) magnetic field will be perpendicular to plane of the other coil.

c) magnetic flux linked with the other coil is maximum.

d) current induced in the other coil is maximum.

6.3 Faraday's Laws of EMI $e = -d\phi/dt$
6.4 Lenz's law
6.5 Motional Electromotive Force

(MHT-CET 2001)

A coil having effective area A, is held with its plane normal to a magnetic field of induction B. The magnetic induction is quickly reduced to 25% of its initial value in 2 s. Then e.m.f. induced across the coil will be

a) $\frac{3AB}{8}$ b) $\frac{3AB}{4}$ c) $\frac{AB}{4}$ d) $\frac{AB}{2}$

(MHT-CET 2003)

Flux passing through coil changes from 2×10^{-3} Wb to 3×10^{-3} Wb during 25 s. The induced e.m.f. is

a) 0.02 mV b) 0.03 mV c) 0.05 mV d) 0.04 mV

A metal rod, 10 cm long is moving with a speed of 10 m/s perpendicular to a uniform magnetic field of 10^{-4} Wb/m^2. The magnitude of e.m.f. induced is

a) 10^{-4} V b) 10^{-2} V c) 0 V d) 10^{-6} V

(MHT-CET 2004)

For a coil of unit area, induction is doubled in 0.2s. Then the induced e.m.f. is

a) 5 B b) 10 B c) 8 B d) 4 B

7. A half metre rod is rotating about one fixed end perpendicular to uniform magnetic field 4×10^{-5} T with angular velocity 720 rpm. The e.m.f. induced across its ends is
a) 0.24 V b) 0.36 V c) 0.12 V d) 0.36 mV
(MHT-CET 2005)

8. A copper rod of length l is rotated about one end perpendicular to uniform magnetic field B with constant angular velocity ω. The induced e.m.f. between two ends is
a) $B\omega l^2$ b) $2B\omega l^2$ c) $\frac{1}{2}B\omega l^2$ d) $\frac{3}{2}B\omega l^2$

9. Resistance of earth coil is 7 Ω. If flux associated with coil changes from 1.35 Wb to 0.79 Wb within 0.1 s, the charge produced by the earth coil is
a) 0.08 C b) 0.008 C c) 0.8 C d) 0.04 C
(MHT-CET 2006)

10. A wire of length 2.5 km and resistance 35 Ω has fallen from a height of 10 m in the earth's horizontal field of 2×10^{-5} T. The current through the coil is :
a) 0.02 A b) 0.002 A c) 0.2 A d) 2 A
(MHT-CET 2007)

11. A rod of length l is rotated about its one end, perpendicular to the magnetic field of induction B. The emf induced in the rod is
a) $Bl^2\omega$ b) $0.5\,Bl^2\omega$ c) $Bl\omega$ d) $0.5\,Bl\omega$
(MHT-CET 2008)

12. A rectangular coil of 25 turns, area of 25 cm^2 and resistance 4 Ω/turn is placed perpendicular to a varying magnetic field which changes at the rate of 500 T/S. Calculate the induced current in the coil.
a) 0.3125 A b) 31.25 A c) 4.25 A d) 9.8 A
(MH-CET 2015)

13. The capacity of a parallel plate air capacitor is 2 μF and voltage between the plates is changing at the rate of 3 V/s. The displacement current in the capacitor is
a) 2μA b) 3μA c) 5μA d) 6μA
(MH-CET 2016)

14. Magnetic flux passing through a coil is initially 4×10^{-4} Wb. It reduces to 10% of its original value in 't' seconds. If the e.m.f. induced is 0.72 mV then 't' in seconds is
a) 0.3 b) 0.4 c) 0.5 d) 0.6
(MHT-CET 2020)

15. A coil of 'n' turns and resistance 'R' Ω is connected in series with a resistance $\frac{R}{2}$. The combination is moved for time t seconds through flux ϕ_1 to ϕ_2. The induced current in the circuit is
a) $\frac{n(\phi_1-\phi_2)}{3Rt}$ b) $\frac{2n(\phi_1-\phi_2)}{Rt}$
c) $\frac{2n(\phi_1-\phi_2)}{3Rt}$ d) $\frac{n(\phi_1-\phi_2)}{2Rt}$

16. The magnetic flux changes from 'zero' to 3×10^{-4} Wb in time 't' through a coil of 100 turns. If the emf induced in the coil is 1.5 V, value of t in seconds is
a) 0.4 b) 0.1 c) 0.02 d) 1

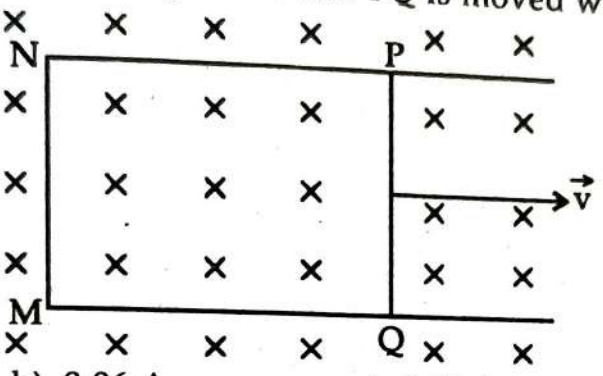
At what rate a single conductor should cut the magnetic flux so that current of 1.5 mA flows through it when a resistance of 5 Ω is connected across its ends ?

a) $6 \times 10^{-3} \frac{wb}{s}$ b) $8 \times 10^{-3} \frac{wb}{s}$ c) $4 \times 10^{-4} \frac{wb}{s}$ d) $7.5 \times 10^{-3} \frac{wb}{s}$

A wire of length 'L' having resistance 'R' falls from a height 'l' in earth's horizontal magnetic field 'B'. The current through the wire is

a) $\frac{BL\sqrt{2gl}}{R}$ b) $\frac{BL\sqrt{2gl}}{R^2}$ c) $\frac{2BLgl}{R^2}$ d) $\frac{B^2L^2}{R}$

A rectangular loop PQMN with movable arm PQ of length 12 cm and resistance 2 Ω is placed in a uniform magnetic field of 0.1 T acting perpendicular to the plane of the loop as shown in figure. The resistances of the arms MN, NP and MQ are negligible. The current induced in the loop when arm PQ is moved with velocity 20 ms^{-1} is



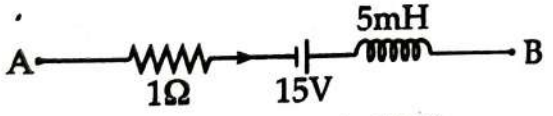
a) 0.12 A b) 0.06 A c) 0.24 A d) 0.18 A

A coil has an area 0.06 m^2 and it has 600 turns. After placing the coil in a magnetic field of strength 5×10^{-5} Wbm^{-2}, it is rotated through 90° in 0.2 seconds. The magnitude of average e.m.f. induced in the coil is

a) 12×10^{-3} V b) 3 mV c) 3 V d) 9×10^{-3} V

(MHT-CET 2022)

The network shown in the figure is a part of a complete circuit. If at a certain instant the current is 5 A and is decreasing at the rate of 10^3 A/s, then $V_A - B_B$ is



a) 20 V b) 5 V c) 10 V d) 15 V

A rectangular coil of 20 turns and area of cross section 25 cm^2 has a resistance of 100 Ω. If a magnetic field which is perpendicular to the plane of the coil changes at a rate of 1000 T/s, then the current induced in the coil will be

a) 5 A b) 0.5 A c) 50 A d) 1 A

6.6 Generators

(MHT-CET 2004)

The peak value of alternating voltage is 423 V. Its root mean square value is

a) 300 V b) 423 V c) $423\sqrt{2}$ V d) zero

(MHT-CET 2005)

An alternating e.m.f. $e = 300 \sin 100 \pi t$ volt, is applied to a pure resistance of 100 Ω. The r.m.s. current through the circuit is

a) 2.12 A b) 0.212 A c) 20.12 A d) 0.0212 A

(MHT-CET 2008)

25. A coil of 50 turns, each of area 0.12 m^2 is rotated at a constant speed of 600 revolutions per minute in a uniform magnetic field of induction 0.02 T about an axis in the plane of the coil and perpendicular to the direction of the field. The maximum e.m.f. induced in the coil is
a) 7.536 V b) 0.75 V c) 0.075 V d) 0.0075 V

6.7 Eddy Currents

(MHT-CET 2004)

26. An emf induced in a coil rotating in a uniform magnetic field is given by
a) $e = e_0 \sin \omega t$ b) $e_0 = e \sin \omega t$ c) $e = \sin \omega t$ d) $e = e_0 \tan \omega t$

27. Dead beat galvanometer works on the principle of
a) eddy current b) self inductance
c) mutual inductance d) magnetic effect of electric current

(MHT-CET 2005)

28. In the induction coil, across secondary coil, the output voltage is practically
a) unidirectional, high, intermittent b) directional, low, intermittent
c) unidirectional, high, constant d) unidirectional, low, constant

6.8 Self Induction

(MHT-CET 2002)

29. In a coil, L = 5 H, current changes at rate of 2 A/s. The e.m.f. induced is
a) – 10 V b) 10 V c) 5 V d) – 5 V

30. A varying current in a coil changes from 10 A to zero in 0.5 sec. If the average e.m.f. induced in the coil is 220 V, then the self inductance of the coil is
a) 5 H b) 10 H c) 11 H d) 22 H

(MHT-CET 2006)

31. An e.m.f. of 20 mV is induced in a solenoid by a rate of change of current 4 A/s. The self inductance of the solenoid is
a) 3 mH b) 4 mH c) 5 mH d) 6 mH

(MHT-CET 2007)

32. A coil of self inductance 20 mH, having 50 turns, carries a current of 300 mA. If the area of the coil is 2 cm^2, the magnetic induction at the centre of the coil is
a) 7.5×10^{-3} T b) 7.5×10^{-2} T c) 1.1×10^{-3} T d) 4.1×10^{-3} T

(MHT-CET 2010)

33. When the number of turns and length of a solenoid are doubled keeping the area of cross section same, the inductance becomes
a) half b) zero c) two times d) four times

(MHT-CET 2011)

34. If the current through a coil changes from +2 A to –2A in 0.05 sec and 8 V emf is developed in the coil then the self inductance of the coil is
a) 0.05 H b) 0.1 H c) 0.2 H d) 0.4 H

(MHT-CET 2012)

35. The self inductance of coil of 400 turns is 8 mH. If current of 5 mA flows in it, then flux associated with the coil is
a) $(\mu_0/4\pi)$ b) μ_0 c) $\frac{\mu_0}{100\pi}$ d) $(4\pi/\mu_0)$

(MH-CET 2017)

43. Two coils P and Q are kept near each other. When no current flows through coil P and current increases in coil Q at the rate 10 A/s, the e.m.f. in coil P is 15 mV. When coil Q carries no current and current of 1.8 A flows through coil P, the magnetic flux linked with the coil Q is

a) 1.4 mWb b) 2.2 mWb c) 2.7 mWb d) 2.9 mWb

(MHT-CET 2019)

44. An alternating current of frequency 200 rad/s and peak value 1 A is applied to the primary of a transformer. If the coefficient of mutual induction between the primary and the secondary is 1.5 H, then the voltage induced in the secondary will be approximately

a) 471 V b) 191 V c) 300 V d) 220 V

(MHT-CET 2020)

45. Two coils P and Q have mutual inductance 'M' H. If the current in the primary is $I = I_0 \sin \omega t$, then the maximum value of e.m.f. induced in coil Q is

a) $\frac{M}{I_0\omega}$ b) $I_0M\omega$ c) $\frac{I_0}{M\omega}$ d) $\frac{\omega}{I_0M}$

46. Alternating current of peak value $(2/\pi)$ A flows through the primary coil of transformer. The coefficient of mutual inductance between primary and secondary coil is 1 H. The peak e.m.f. induced in secondary coil is (Frequency of a.c. = 50 Hz)

a) 100 V b) 400 V c) 300 V d) 200 V

47. The mutual inductance between two coplanar concentric rings A and B of radii 'R_1' and 'R_2' placed in air when a current 'I' flows through ring A is ($R_1 >> R_2$)

a) $\frac{\mu_0\pi R_2}{R_1}$ b) $\frac{\mu_0\pi R_1}{R_2}$ c) $\frac{\mu_0\pi R_1^2}{2R_2}$ d) $\frac{\mu_0\pi R_2^2}{2R_1}$

48. A 50 Hz a.c. of peak value 1 A flows through the primary of a transformer. If the mutual inductance between the primary and secondary is 1.5 H then the peak voltage in the secondary is

a) 150 V b) 300 V c) 250 V d) 471 V

49. The mutual inductance (M) of two coils is given as 3.6 H. If the self inductances of the coils are $L_1 = 16$ H, $L_2 = 9$ H, then coefficient of coupling between the coils is

a) 15% b) 20% c) 30% d) 10%

(MHT-CET 2022)

50. The coefficient of mutual induction is 2 H and induced e.m.f. across secondary is 2 kV. Current in the primary is reduced from 6 A to 3 A. The time required for the change of current is

a) 4×10^{-3} s b) 6×10^{-3} s c) 8×10^{-3} s d) 3×10^{-3} s

6.12 Transformer

(MHT-CET 2010)

51. A transformer is having 2100 turns in primary and 4200 turns in secondary. An ac source of 120V, 10 A is connected to its primary. The secondary voltage and current are

a) 240 V, 5 A b) 120 V, 10 A c) 240 V, 10 A d) 120 V, 20 A