

Unit: 4. EMI & AC (25 marks)

1 mark → 4 Questions 5 mark → 1 Question 55

3 mark → 2 Questions 37, 38 10 mark → 1 Question 65

UNIT – 4. EMI & AC – 1 mark questions

- The angle between \vec{A} and plane area of the coil is ----
a) π **b) $\pi/2$** [M-06, J-09]
c) 2π d) 0°
- Electromagnetic induction is not used in [DPM, M-06, J-07, M-08, J-09]
a) iron box **b) room heater**
c) transformer d) choke coil
- Lenz's law is in accordance with the law of – [M-07, M-08, 11, 12, J-12]
a) conservation of energy b) conservation of charge
c) conservation of momentum d) conservation of angular momentum
- The unit of henry can also be written as -----
a) $V A s^{-1}$ b) $Wb A$
c) Ωs **d) all these** [DPM, J-06, J-11, M-12]
- The generator rule is ----- [O-06, J-07]
a) FLHR **b) FRHR**
c) Maxwell's cork screw rule d) right hand palm rule
- Transformer works on ---- [M-07, S-07, J-10, M-11]
a) both AC and DC b) AC more effectively than DC
c) AC only d) DC only
- In a transformer, eddy current loss can be minimized by using
a) laminated core made of Mumetal
b) laminated core made of stelloy
c) shell tupe core d) thick copper wires [M-08]
- The co-efficient of self induction of a solenoid is independent of
a) the number of turns of solenoid
b) area of the cross section of the solenoid
c) the length of solenoid **d) the current passing through the coil** [S-12]
- Which of the following cannot be stepped up in a transformer? [J-08, S-09]
a) input current b) input voltage
c) input power d) all of these
- The power loss is less in transmission line when [O-06, M-13]
a) voltage is less but current is more
b) both voltage and current are more
c) voltage is more but current is less
d) both voltage and current are less
- self inductance of a straight conductor is ----
a) **a) zero** b) infinity
c) very large d) very small
[M-07, M-09, J-10, O-11, J-12, 13, M-13]
- Which of the following devices does not allow d.c to pass through - [DPM, J-09, M-10, O-10, J-11, 13, O-11, M-12, 13]
a) capacitor b) inductor
c) resistor d) all the above
- In a three phase AC generator the three coils are fastened rigidly together and are displaced from each other by an angle ---
a) 90° b) 180° **c) 120°** d) 360° [S-08]
- The effective value of alternating current is ----
a) $I_0/2$ **b) $I_0/\sqrt{2}$** c) $I_0\sqrt{2}$ d) $2I_0$ [J-10]
- A rectangular coil is uniformly rotated in a uniform magnetic field such that the axis of rotation is perpendicular to the direction of the magnetic field. When the plane of the coil is perpendicular to the magnetic field ---- [O-10]
a) (i) magnetic flux is zero (ii) induced emf is zero
b) (i) magnetic flux is maximum (ii) induced emf is maximum
c) magnetic flux is maximum (ii) induced emf is zero
d) (i) magnetic flux is zero (ii) induced emf is maximum
- In an A.C circuit ----- [M-09]
a) average value of current is zero
b) the average value of square of current is zero
c) the average power dissipation is zero
d) the rms current is $\sqrt{2}$ times of peak current
- In a.c circuit with an inductor -- [J-06]
a) current lags the voltage by $\pi/2$
b) voltage leads the current by $\pi/2$
c) voltage and current are in phase d) none of these
- In a.c circuit voltage leads the current by a phase of $\pi/2$, then the circuit has ----- [M-11]
a) only an inductor L b) only a capacitor (C)
c) Only resistor (R) d) L, C and R in series
- In an A.C circuit the applied emf $i = I_0 \sin(\omega t - \pi/2)$ lags behind the emf $e = E_0 \sin(\omega t + \pi/2)$ by ---- [O-06]
a) 0 b) $\pi/4$
c) $\pi/2$ **d) π**
- In an A.C circuit the applied emf $e = E_0 \sin(\omega t + \pi/2)$ leads the current $i = I_0 \sin(\omega t - \pi/2)$ by ---- [DMP]
a) $\pi/2$ b) $\pi/4$
c) π d) 0
- The instantaneous emf and current equations of an a.c. circuit are respectively $e = 200 \sin(\omega t + \frac{\pi}{3})$ and $i = 10 \sin \omega t$. The average power consumed over one complete cycle is : [M-13]
a) 2000 W b) 1000 W **c) 500 W** d) 707 W
- In a series RLC circuit, the instantaneous values of current and emf are $i = I_0 \sin(\omega t - \pi/3)$ and $e = E_0 \sin \omega t$ respectively. The phase difference between the current and voltage is : [J-13]
a) zero b) 180° **c) 60°** d) 45°
- In LCR series circuit at resonance --- [S-09, 10]
a) impedance (Z) is maximum b) current is minimum
c) impedance is equal to R d) $\gamma_0 = 1/\sqrt{LC}$
- In LCR circuit when $X_L = X_C$, the current ----- [M-07]
a) is zero **b) is in phase with the voltage**
c) leads the voltage d) lags behind the voltage
- In RLC circuit, at resonance ----- [S-08, 10]
a) current is minimum b) impedance is maximum
c) circuit is purely inductive **d) current is in phase with the voltage**
- In a series LCR circuit, at resonance ----- [S-10]
a) **$X_L = X_C$** b) $X_L > X_C$
c) $X_L < X_C$ d) $\omega = \frac{1}{LC}$

- set up between the tips of the wings if the velocity of the aero plane is 720 km/hr. [O-06]
- An ideal transformer has transformation ratio 1:20. If the input power and the primary voltage are 600 mW and 6 V respectively, find the primary and secondary currents. [S-08]
 - A solenoid of length 1 m and 0.05 m diameter has 500 turns. If a current of 2 A passes through the coil, calculate the co-efficient of self-induction of the coil. [M-13]
 - A coil of area of cross section 0.5 m^2 with 10 turns is in a plane perpendicular to a uniform magnetic field of 0.2 Wb/m^2 . Calculate the flux through the coil. [M-07]
 - A capacitor of capacitance $2 \mu\text{F}$ is in an a.c circuit with 1000 Hz. If the rms value of applied emf is 10 V, find the effective current flowing in the circuit. [J-08]
 - Calculate the capacitive reactance of a capacitor of capacitance $2 \mu\text{F}$ in an Ac circuit of frequency 1000 Hz. [J-09]
 - Write the equation of a 25 cycle current sine wave having rms value of 30 A. [O-11,M-12,J-13]

UNIT – 4. EMI & AC – 5 mark Questions

- State Faraday's laws and Lenz's law in electromagnetic induction. [J-11]
- Explain the mutual induction between two long solenoids. Obtain an expression for the mutual inductance of two long solenoids. [J-08,M-12]
- Explain any two applications of eddy current. [M-10]
- Define efficiency of a transformer. Explain the various losses of a transformer? Explain how they can be minimized? [DPM,J-10,M-11]
- Obtain the phase relation between current and voltage in an A.C with an inductor only. (graph not necessary) [M-06,08]
- Explain how induced emf can be produced by changing the area enclosed by the coil? [J-07,13, S-7,13, S-08,12, M-09]
- What are the reasons for the various losses of a transformer? Explain how they can be minimized? [J-06, O-06,09,J-10]
- Give the application of eddy currents. [M-07]
- Obtain an expression for the current flowing in a circuit containing resistance only to which alternating emf is applied. Find the phase relationship between voltage and current. [O-11,J-12]

UNIT – 4. EMI & AC – 5 mark Problems

- An a,c generator of a coil of 10,000 turns and area 100 cm^2 . The coil rotates at an angular speed of 140 rpm in a uniform magnetic field of $3.6 \times 10^{-2} \text{ T}$. Find the maximum value of emf induced. [J-09]

UNIT – 4. EMI & AC – 10 mark Questions

- Discuss with theory, the method of inducing emf in a coil by changing its orientation with respect to the direction of the magnetic field. [DPM,J-08,S-09, M-10,J-10,O-11,M-13]
- Describe the principle, construction and working of a single phase a.c generator. [M-07,08,11, J-07,13,S-7,11,12,O-10]
- What are eddy currents? Explain their applications. How are they minimized? [M-09]
- Explain the principle, construction and theory of a transformer. (Diagram not necessary). Define its efficiency. Mention the energy losses. [M-06,M-12,J-13]
- A source of an alternating e.m.f. is connected to a series combination of resistor R, an inductor L and a capacitor C. obtain with the help of a voltage phasor diagram and impedance diagram, expressions for

i) effective voltage ii) the impedance, iii) phase relationship between the current and voltage. [J-06,J-09, S-12]

- Obtain the phase relation between voltage and current in an AC circuit containing a pure inductance. Draw the necessary graph. [O-08]

- In an a.c circuit containing a capacitor, the instantaneous emf is $e = E_0 \sin \omega t$. Obtain the expression for current. Explain the phase relation between emf and current by graph. [O-06]

30th July 2013

!