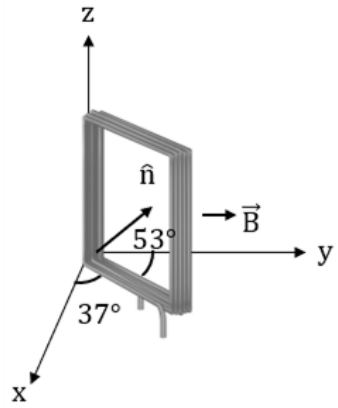
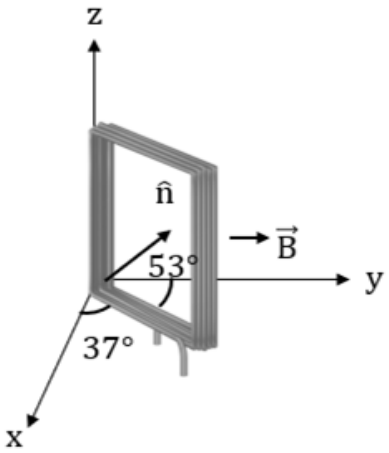
Q.1 The square loop in the figure has sides of length 20 cm. It has 5 turns and carries a current of 2 A. The normal to the loop is at 37° to a uniform field $\vec{B} = 0.5\hat{j}$ T. Find the magnetic moment.



(A) $(-0.24\hat{i} + 0.32\hat{j})$ Am^2 **(B)** $(0.24\hat{i} + 0.32\hat{j})$ Am^2

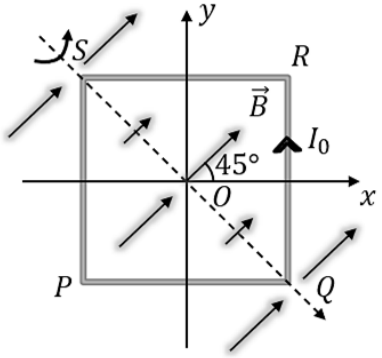
(C) $(-0.24\hat{i} - 0.32\hat{j})$ Am^2 **(D)** $(0.24\hat{i} - 0.32\hat{j})$ Am^2

Q.2 The square loop in the figure has sides of length 20 cm. It has 5 turns and carries a current of 2 A. The normal to the loop is at 37° to a uniform field $\vec{B} = 0.5\hat{j}$ T. Find the torque on the loop.



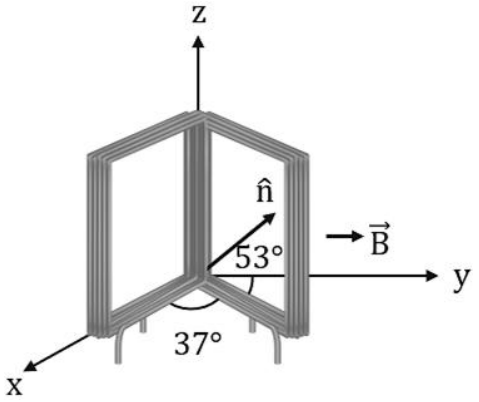
(A) $0.12\,\hat{k}$ Nm **(B)** $-0.12\,\hat{k}$ Nm **(C)** $0.12\,\hat{j}$ Nm **(D)** $-0.12\,\hat{j}$ Nm

Q.3 A uniform constant magnetic field $\vec{B}$ is directed at an angle of 45° to the x −axis in the x − y plane. PQRS is a rigid, square wire frame carrying a steady current I_o (anticlockwise), with its centre at origin O. At time t = 0, the frame is at rest in the position shown in the figure with its sides parallel to the x and y axes. Each side of the frame is of mass M and length L. What is the magnitude of torque τ about O acting on the frame due to the magnetic field?



(A) $I_o L^2 B$ **(B)** $2I_o L^2 B$ **(C)** $\frac{I_o L^2 B}{2}$ **(D)** $\frac{I_o L^2 B}{\sqrt{2}}$

Q.4 The square loop in the figure has sides of length 20 cm. It has 5 turns and carries a current of 2 A. The normal to the loop is at 37° to a uniform field, B = 0.5ĵ T. Find the work needed to rotate the loop from its position of minimum energy to the given orientation.

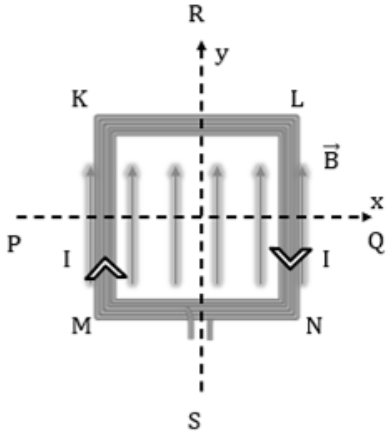


(A) −0.04 J **(B)** +0.04 J **(C)** −0.02 J **(D)** +0.02 J

Q.5 A wire of length l = 2 m is bent to form a circular coil having some turns. A current i = 10 A is established in the coil, and it is placed in a uniform magnetic field B = 10π mT. The maximum torque that acts on the coil is

(A) 0.4 Nm **(B)** 0.1 Nm **(C)** 0.2 Nm **(D)** Zero

Q.6 A square loop of wire carrying current I is lying in the plane of paper as shown in figure. The magnetic field is present in the region as shown. The loop will tend to rotate: (Take length of the side of the square as l and assume PQ is along +x axis and RS is along +y axis)



(A) about PQ with KL coming out of the page, with the net torque IBl^2î.

(B) about PQ with KL coming out of the page, with the net torque IBl^2ĵ.

(C) aboutRS with MK coming out of the page, with the net torqueIBl^2ĵ.

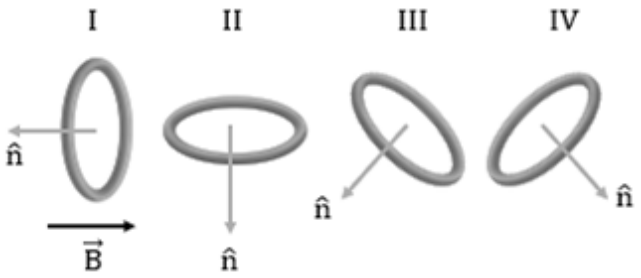
(D) about RS with MK going into the page, with the net torque IBl^2î.

Q.7 A current carrying circular loop is placed in a uniform magnetic field B, the potential energy is minimum when the magnetic moment of the loop is

(A) Parallel to B **(B)** Perpendicular to B

(C) Inclined at an angle of 45° to B **(D)** Anti- parallel to B

Q.8 The figure represents four positions of a current carrying loop in a uniform magnetic field directed towards the right. $\hat{n}$ represents the direction of the area vector of the loop. The correct order of potential energy is



(A) I $>$ *II* $>$ *IV* $>$ *III* **(B)** I $<$ *III* $<$ *II* $<$ *IV*

(C) III $>$ *II* $>$ *IV* $>$ *I* **(D)** I $>$ *III* $>$ *II* $>$ *IV*

Q.9 Assertion:A rectangular current loop is in an arbitrary orientation in an external uniform magnetic field. No work is required to rotate the loop about an axis perpendicular to its plane.

Reason: All positions represent the same level of energy.

(A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
(B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
(C) Assertion is correct, Reason is incorrect.
(D) Assertion is incorrect, but Reason is correct.

Q.10 The torque and magnetic potential energy of a magnetic dipole in most stable position in a uniform magnetic field of magnetic strength 5 T, having magnetic moment $\mu = 2$ Am^2 will be

(A) $+10$ J, $+20$ J **(B)** $+20$ J, -10 J **(C)** $+0$ J, -10 J **(D)** $+20$ J, $+0$ J

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(B)	(A)	(B)	(B)	(A)	(A)	(D)	(A)	(C)

ANSWER KEY