MAGNETIC EFFECTS OF ELECTRIC CURRENT DPP-1

1. A circular current carrying coil has a radius R. The distance from the center of the coil on the axis where the magnetic induction will be $\frac{1}{8}th$ to its value at the center of the coil, is

(a) $\frac{R}{\sqrt{3}}$ (b) $R\sqrt{3}$

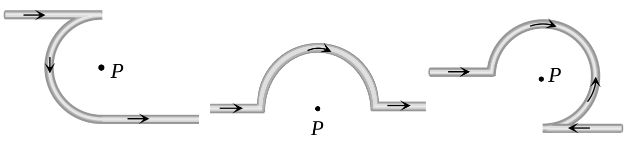
(c) $2\sqrt{3}\,R$ (d) $\frac{2}{\sqrt{3}}R$

2. The field normal to the plane of a wire of n turns and radius r which carries a current i is measured on the axis of the coil at a small distance h from the center of the coil. This is smaller than the field at the center by the fraction

(a) $\frac{3}{2}\frac{h^2}{r^2}$ (b) $\frac{2}{3}\frac{h^2}{r^2}$

(c) $\frac{3}{2}\frac{r^2}{h^2}$ (d) $\frac{2}{3}\frac{r^2}{h^2}$

3. The magnetic field at the center of a circular coil of radius r is π times that due to a long straight wire at a distance r from it, for equal currents. Figure here shows three cases : in all cases the circular part has radius r and straight ones are infinitely long. For same current the B field at the center P in cases 1, 2, 3 have the ratio



(1) (2) (3)

(a) $\left(-\frac{\pi}{2}\right):\left(\frac{\pi}{2}\right):\left(\frac{3\pi}{4}-\frac{1}{2}\right)$

(b) $\left(-\frac{\pi}{2}+1\right):\left(\frac{\pi}{2}+1\right):\left(\frac{3\pi}{4}+\frac{1}{2}\right)$

(c) $-\frac{\pi}{2}:\frac{\pi}{2}:3\frac{\pi}{4}$

(d) $\left(-\frac{\pi}{2}-1\right):\left(\frac{\pi}{2}-\frac{1}{4}\right):\left(\frac{3\pi}{4}+\frac{1}{2}\right)$

4. Two straight long conductors AOB and COD are perpendicular to each other and carry currents i_1 and i_2. The magnitude of the magnetic induction at a point P at a distance a from the point O in a direction perpendicular to the plane $ACBD$ is

(a) $\frac{\mu_0}{2\pi a}(i_1+i_2)$ (b) $\frac{\mu_0}{2\pi a}(i_1-i_2)$

(c) $\frac{\mu_0}{2\pi a}(i_1^2+i_2^2)^{1/2}$ (d) $\frac{\mu_0}{2\pi a}\frac{i_1 i_2}{(i_1+i_2)}$

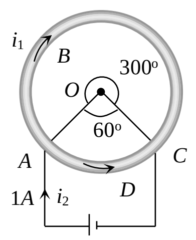
5. A cell is connected between the points A and C of a circular conductor $ABCD$ of center O with angle $AOC = 60^o$. If B_1 and B_2 are the magnitudes of the magnetic fields at O due to the currents in ABC and ADC respectively, the ratio $\frac{B_1}{B_2}$ is

(a) 0.2

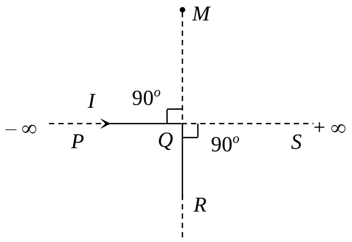
(b) 6

(c) 1

(d) 5



6. An infinitely long conductor *PQR* is bent to form a right angle as shown. A current *I* flows through *PQR* The magnetic field due to this current at the point *M* is H_1. Now another infinitely long straight conductor *QS* is connected at *Q* so that the current is *I*/2 in *QR* as well as in *QS, The current in PQ* remaining unchanged. The magnetic field at *M* is now $H_{2.}$ The ratio H_1/H_2 is given by



(a) $\frac{1}{2}$

(b) 1

(c) $\frac{2}{3}$

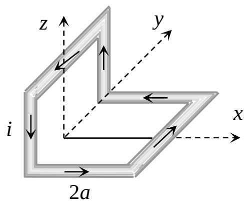
(d) 2

7. A coil having *N* turns is wound tightly in the form of a spiral with inner and outer radii *a* and *b* respectively. When a current I passes through the coil, the magnetic field at the center is

(a) $\frac{\mu_0 NI}{b}$ (b) $\frac{2\mu_0 NI}{a}$

(c) $\frac{\mu_0 NI}{2(b-a)}\ln\frac{b}{a}$ (d) $\frac{\mu_0 I^N}{2(b-a)}\ln\frac{b}{a}$

8. A non-planar loop of conducting wire carrying a current *I* is placed as shown in the figure. Each of the straight sections of the loop is of length 2*a*. The magnetic field due to this loop at the point *P* (*a*,0,*a)* points in the direction



(a) $\frac{1}{\sqrt{2}}(-\hat{j}+\hat{k})$

(b) $\frac{1}{\sqrt{3}}(-\hat{j}+\hat{k}+\hat{i})$

(c) $\frac{1}{\sqrt{3}}(\hat{i}+\hat{j}+\hat{k})$

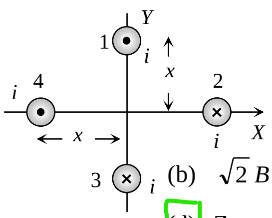
(d) $\frac{1}{\sqrt{2}}(\hat{i}+\hat{k})$

9. A long straight wire along the *z*-axis carries a current *I* in the negative *z* direction. The magnetic vector field $\vec{B}$ at a point having coordinates (x, y) in the $z = 0$ plane is

(a) $\frac{\mu_o I(y\hat{i}-x\hat{j})}{2\pi(x^2+y^2)}$ (b) $\frac{\mu_o I(x\hat{i}+y\hat{j})}{2\pi(x^2+y^2)}$

(c) $\frac{\mu_o I(x\hat{j}-y\hat{i})}{2\pi(x^2+y^2)}$ (d) $\frac{\mu_o I(x\hat{i}-y\hat{j})}{2\pi(x^2+y^2)}$

10. What will be the resultant magnetic field at origin due to four infinite length wires. If each wire produces magnetic field '*B*' at origin



(a) 4 *B* (b) $\sqrt{2}\,B$

(c) $2\sqrt{2}\,B$ (d) Zero

11. The ratio of the magnetic field at the center of a current carrying circular wire and the magnetic field at the centre of a square coil made from the same length of wire will be

(a) $\frac{\pi^2}{4\sqrt{2}}$ (b) $\frac{\pi^2}{8\sqrt{2}}$

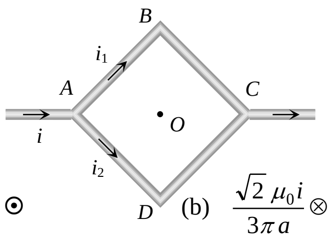
(c) $\frac{\pi}{2\sqrt{2}}$ (d) $\frac{\pi}{4\sqrt{2}}$

12. Two infinite length wires carries currents $8A$ and $6A$ respectively and placed along X and Y-axis. Magnetic field at a point $P(0,0,d)m$ will be

(a) $\frac{7\mu_0}{\pi d}$ (b) $\frac{10\mu_0}{\pi d}$

(c) $\frac{14\mu_0}{\pi d}$ (d) $\frac{5\mu_0}{\pi d}$

13. Figure shows a square loop $ABCD$ with edge length a. The resistance of the wire ABC is r and that of ADC is $2r$. The value of magnetic field at the center of the loop assuming uniform wire is



(a) $\frac{\sqrt{2}\,\mu_0 i}{3\pi a}\odot$ (b) $\frac{\sqrt{2}\,\mu_0 i}{3\pi a}\otimes$

(c) $\frac{\sqrt{2}\,\mu_0 i}{\pi a}\odot$ (d) $\frac{\sqrt{2}\,\mu_0 i}{\pi a}\otimes$

14. A current i is flowing in a straight conductor of length L. The magnetic induction at a point distant $\frac{L}{4}$ from its center will be

(a) $\frac{4\mu_0 i}{\sqrt{5}\pi L}$ (b) $\frac{\mu_0 i}{2\pi L}$

(c) $\frac{\mu_0 i}{\sqrt{2} L}$ (d) Zero

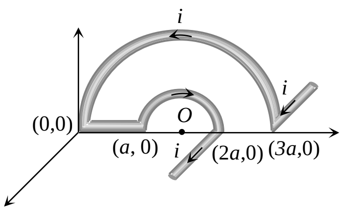
15. In the given figure net magnetic field at O will be

(a) $\frac{2\mu_0 i}{3\pi a}\sqrt{4-\pi^2}$

(b) $\frac{\mu_0 i}{3\pi a}\sqrt{4+\pi^2}$

(c) $\frac{2\mu_0 i}{3\pi a^2}\sqrt{4+\pi^2}$

(d) $\frac{2\mu_0 i}{3\pi a}\sqrt{(4-\pi^2)}$



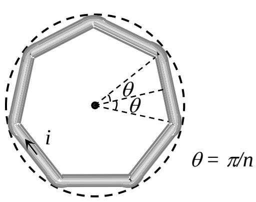
16. In the following figure a wire bent in the form of a regular polygon of n sides is inscribed in a circle of radius a. Net magnetic field at centre will be

(a) $\frac{\mu_0 i}{2\pi a}\tan\frac{\pi}{n}$

(b) $\frac{\mu_0 n i}{2\pi a}\tan\frac{\pi}{n}$

(c) $\frac{2}{\pi}\frac{ni}{a}\mu_0\tan\frac{\pi}{n}$

(d) $\frac{ni}{2a}\mu_0\tan\frac{\pi}{n}$



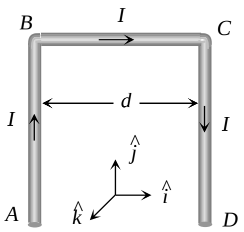
17. *AB* and *CD* are long straight conductor, distance *d* apart, carrying *a* current *I*. The magnetic field at the midpoint of *BC* is

(a) $\frac{-\mu_0 I}{2\pi d}\hat{k}$

(b) $\frac{-\mu_0 I}{\pi d}\hat{k}$

(c) $\frac{-\mu_0 I}{4\pi d}\hat{k}$

(d) $\frac{-\mu_0 I}{8\pi d}\hat{k}$



18. The unit vectors $\hat{i}$, $\hat{j}$ and $\hat{k}$ are as shown below. What will be the magnetic field at *O* in the following figure

(a) $\frac{\mu_0}{4\pi}\frac{i}{a}\left(2-\frac{\pi}{2}\right)\hat{j}$

(b) $\frac{\mu_0}{4\pi}\frac{i}{a}\left(2+\frac{\pi}{2}\right)\hat{j}$

(c) $\frac{\mu_0}{4\pi}\frac{i}{a}\left(2+\frac{\pi}{2}\right)\hat{i}$

(d) $\frac{\mu_0}{4\pi}\frac{i}{a}\left(2+\frac{\pi}{2}\right)\hat{k}$