## DPP – 04

## SOLUTION

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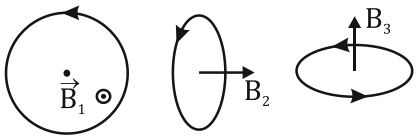
**1.** **K= 3**

**2.**




$\vec{B}_{net} = \vec{B_1} + \vec{B_2} + \vec{B_3}$

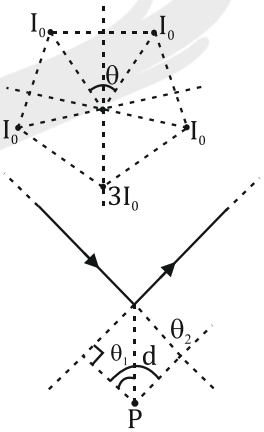
$\vec{B}_{net} = \frac{\mu_0 I}{2R}(\hat{k}) + \frac{\mu_0 I}{2R}(\hat{i}) + \frac{\mu_0 I}{2R}j$

$B_{net} = \frac{\mu_0 I}{2R}\sqrt{3}$

$\alpha + \beta = 3$

**3.** $\theta = \frac{360}{5} = 72°$

$B_0 = \frac{\mu_0 2I}{2\pi a} = \frac{\mu_0 I}{\pi a}$




**4.** $B_p = 2\left[\frac{\mu_0 I}{4\pi d \sin 45}[-\sin\theta_1 + \sin\theta_2]\right.$

$= \frac{\mu_0 I\sqrt{2}}{2\pi d}\left[1 - \frac{1}{\sqrt{2}}\right]$

$B_p = \frac{\mu_0 I}{\sqrt{2}\pi d}\left[1 - \frac{1}{\sqrt{2}}\right] \otimes$

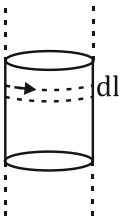
**5.** number of equivalent turns Per unit length is given by

$n = \frac{1}{dl}$

$B = \mu_0 ni$

$B = \mu_0\left(\frac{1}{dl}\right)(\lambda dl) \qquad (i = \lambda dl)$

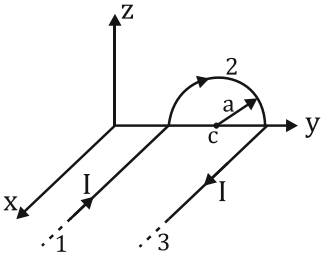
$B = \mu_0 \lambda$




**6.** $\vec{B}_1 = \frac{\mu_0 i}{4\pi a}(-\hat{K})$

$\vec{B}_2 = \frac{\mu_0 I}{4\pi a}(\pi)(-\hat{i})$

$\vec{B}_3 = \frac{\mu_0 I}{4\pi a}(-\hat{k})$




**7.** **(C)**

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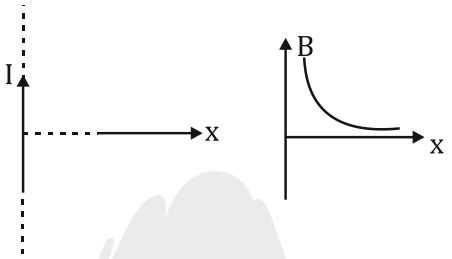
**8.** $B_p = 4\left[\frac{\mu_0 I}{4\pi(2r)} \cdot \frac{\pi}{4}\right] + 4\left[\frac{\mu_0 I}{4\pi r}\left(\frac{\pi}{4}\right)\right]$

$= \frac{\mu_0 I}{8r} + \frac{\mu_0 I}{4r} = \frac{3\mu_0 I}{8r}$

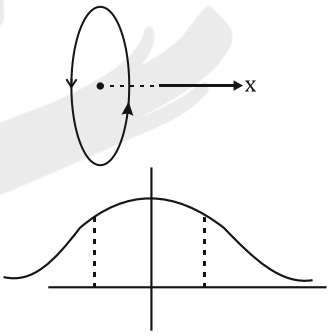
$\vec{B}_p = \frac{3\mu_0 I}{8r} \otimes$

**9.** **(a)** $B = \frac{\mu_0 I}{2\pi x}$




(a) → (r)

**(b)** $B_x = \frac{\mu_0 I R^2}{2(x^2+R^2)^{3/2}}$




$x = 0$

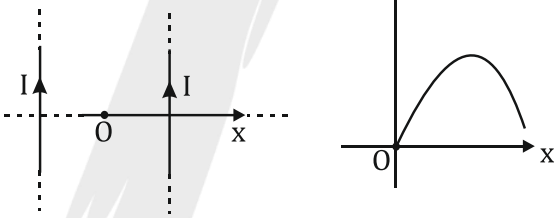
$B_c = \frac{\mu_0 I}{2R}$ at $x = \frac{R}{\sqrt{2}}$

$x = \infty$

$B_\infty = 0$

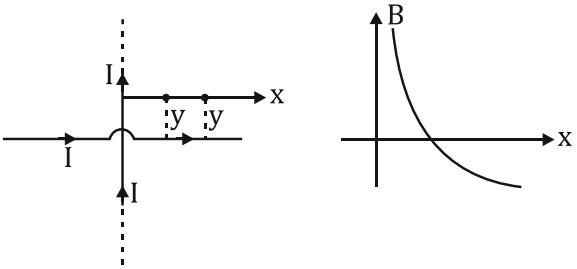
(b) → (q)

**(c)**




(C) → (p)

**(d)**




(d) → (s)

**10.** $I_{avg} = \frac{q\omega}{2\pi} = \frac{\lambda 2\pi R\omega}{2\pi} = \lambda R\omega$

$B_c = \frac{\mu_0 \lambda R\omega}{2R} = \frac{\mu_0 \lambda \omega}{2}$

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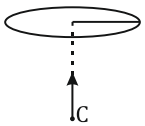
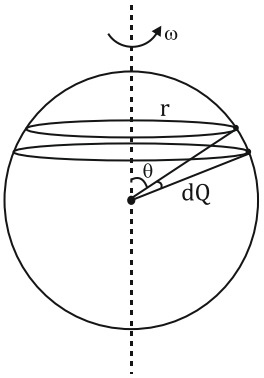
**11.** $Q = \sigma_0 4\pi R^2$

$dQ = \sigma_0\, 2\pi r R d\theta$

$r = R\sin\theta$




$R\cos\theta$




$$dB = \frac{\mu\left(\frac{d\theta\omega}{2\pi}\right)(R\sin\theta)^2}{2(R^2)^{3/2}}$$

$$dB_c = \frac{\mu_0 \omega dQ}{4\pi R}\sin^2\theta$$

$$\int dB_c = \frac{\mu_0 \omega \sigma_0 2\pi R^2}{4\pi R}\int_0^{\pi}\sin^3\theta d\theta$$

$$B_c = \frac{2\mu_0\omega_0\sigma_0 R}{3}$$