Dugga nr. 2 i tif220 för I2 . 2012-10-11

① Two harmonic waves are described by: $y_1 = 3.0\sin[(4x - 700t)\ \text{rad}]$ and $y_2 = 3.0\sin[(4x - 700t - 2)\ \text{rad}]$. What is the amplitude of the resultant wave?

3,0 3,2 0 7,8 8,2 4,3 6,0

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② Two harmonic waves traveling in opposite directions interfere to produce a standing wave described by $y = 2\sin(\pi x)\cos(3\pi t)$ where x is in m and t is in s. What is the distance in m between the first two antinodes?

1 0,5 7 8 2 4

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③ . Two long straight parallel wires separated by a distance of 16 cm each carry a current of 20 A in the same direction. What is the magnitude in μT of the resulting magnetic field at a point that is 10 cm from each wire?

64 48 40 38 57 80

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④ . A planar loop consisting of four turns of wire, each of which encloses 200 cm^2, is oriented perpendicularly to a magnetic field that increases uniformly in magnitude from 10 mT to 25 mT in 5.0 ms. What is the resulting induced current in the coil in mA if the resistance of the coil is 5.0 Ω?

48 6,0 17 60 12 0,24

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⑤ In a double slit experiment, the third bright fringe occurs at a distance of 2 cm from the central bright spot. The slits are 1 mm apart and the screen is 3 m from the slits. What is the wavelength of the light?

$2\cdot10^{-8}$ $0{,}02\cdot10^{-6}$ $2\cdot10^{-7}$ $2\cdot10^{-4}$

$2\cdot10^{-6}$ $0{,}2\cdot10^{4}$

Namn: _____

Dugga 2 för I2 i TIF270 2018-10-11

① $y_1 = 3{,}0 \sin(4x - 700t)$ $y_2 = 3{,}0 \sin(4x - 700t - 2)$ allt i rad.

Två metoder

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

$\Rightarrow \sin(\alpha-\beta) + \sin(\alpha+\beta) = 2\sin\alpha\cos\beta$

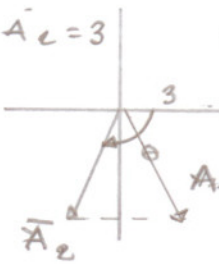
$\alpha = 4x - 700t - 1 \quad \beta = -1$

$\Rightarrow y_1 + y_2 = 3{,}0 \cdot 2 \sin(4x - 700t - 1)\cos(-1)$

$\therefore$ amplitud $= 3{,}0 \cdot 2 \cdot \cos(-1) =$

$= 3{,}24 = \underline{3{,}2}$

$A_1 = A_2 = 3 \quad \theta = -2 \text{ rad} = -114{,}6°$



Y-komp: $A_2 \cdot \sin\theta$

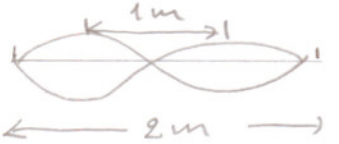
X-komp: $A_1 + A_2\cos\theta$

$A_{tot} = 3\sqrt{[1+\cos(-2)]^2 + \sin^2(-2)} = \underline{3{,}24}$

② Stående våg $y(x,t) = A \cdot \sin kx \cos\omega t \quad k = \frac{2\pi}{\lambda}$

här $y(x,t) = 2 \cdot \sin(\pi x)\cos(3\pi t) \quad \therefore k = \pi\,(m^{-1})$

$\Rightarrow \pi = \frac{2\pi}{\lambda} \Rightarrow \lambda = 2\,m$



ex. 1:a övertonen

Svar: 1m

③ $\bar{B}_{tot} = \bar{B}_1 + \bar{B}_2 \quad |\bar{B}_{tot}| = 2B\sin\varphi$

$\theta + \varphi = 90° \Rightarrow \sin\varphi = \cos\theta = 0{,}6$

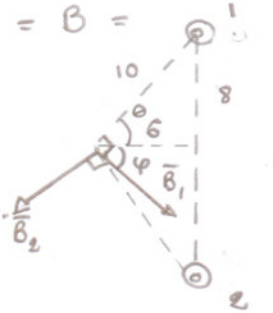
$\Rightarrow |\bar{B}_{tot}| = 2 \cdot 0{,}6 \cdot 2\cdot 10^{-7} \cdot \frac{20}{0{,}1}\,T =$

$= \underline{48\,pT}$

$|\bar{B}_1| = |\bar{B}_2| = B = 2\cdot 10^{-7}\frac{I}{r}$

$I = 20\,A$

$r = 0{,}10\,m$

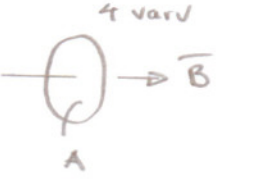


④ $\Phi_B = BA$

$\frac{d\Phi_B}{dt} = A\frac{dB}{dt}$

$\mathcal{E} = N\frac{d\Phi_B}{dt} = NA\frac{dB}{dt}$

$\frac{dB}{dt} = \frac{(2{,}5-10)\,mT}{5\,ms} = 3\,T/s$



$\bar{A} \parallel \bar{B}$

$I = \frac{\mathcal{E}}{R} = \frac{NA\,d\theta/dt}{R} = \frac{4\cdot 200\cdot 10^{-4}\cdot 3}{5{,}0} = 0{,}048\,A = \underline{48\,mA}$

⑤ $d\cdot\sin\theta = m\lambda$

här $d\cdot\sin\theta_3 \approx d\cdot\tan\theta_3 = d\cdot\frac{Y}{L} = 3\lambda$

$\Rightarrow \lambda = \frac{dY}{3L} = \frac{1\cdot 10^{-3}\cdot 2\cdot 10^{-2}}{3\cdot 3} =$

$= 2{,}2\cdot 10^{-6} = \underline{2\cdot 10^{-6}\,m}$