习题十九　波动(一)

1. B　2. D　3. $y=A\cos\left[\omega\left(t+\frac{l+x}{u}\right)+\phi\right]$

4. ~~$y=0.2\cos(0.5\pi t+\frac{\pi}{2}$~~　$y=0.2\cos\left(\frac{\pi}{2}t\pm\frac{\pi}{2}\right)$

5. (1) $y=A\cos\left(\frac{\pi}{2}t+\pi\right)$

(2) $y(0,t)=A\cos\left(\frac{\pi}{2}t-2\pi\frac{d}{\lambda}+\pi\right)$

$y(x,t)=A\cos\left(\frac{\pi}{2}t+2\pi\frac{(x-d)}{\lambda}+\pi\right)$

(3) 将 $d=\frac{1}{2}\lambda$ 代入(2)中 $y(0,t)$ 得

O点振动方程：$y=A\cos\frac{\pi}{2}t$.

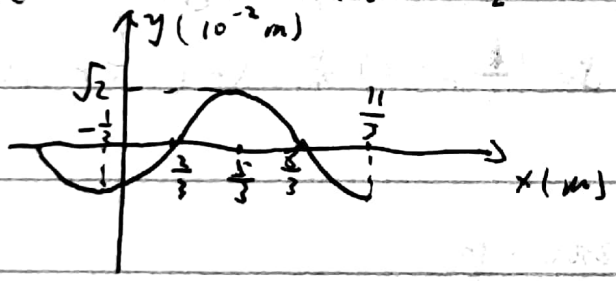
6. (1) 设 $y=A\cos(\omega t+\varphi)$(SI)，$\omega=\frac{2\pi}{T}=\frac{\pi}{2}$　~~$y(0)=1$~~　$A=\sqrt{2}\times10^{-2}$

$y(0)=\sqrt{2}\cos\varphi=\frac{\sqrt{2}}{2}$，$\varphi=\frac{\pi}{3}$

$\therefore y=\sqrt{2}\cos\left(\frac{\pi}{2}t+\frac{\pi}{3}\right)\times10^{-3}$

(2) $y(x,t)=\sqrt{2}\cos\left(\frac{\pi}{2}t-\frac{\pi}{2}x+\frac{\pi}{3}\right)\times10^{-3}$

(3)



习题二十　波动(二)

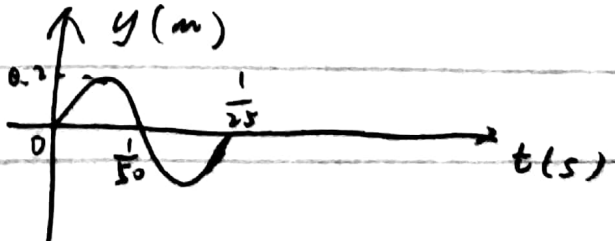
1. D　2. C　3. 4.

4. $S\frac{\lambda\omega}{2\pi}w$

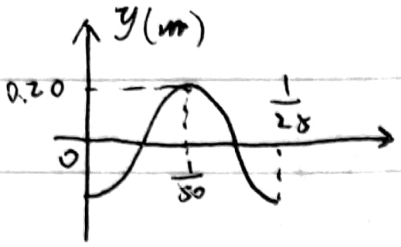
5. P: $y=0.2\cos\left(100\pi t-\frac{\pi}{2}\right)$，　Q: $y=0.2\cos(100\pi t+\pi)$

~~O: $y(0,t)=0.2\cos(100\pi t$~~

P：



Q:



6. (1) $y = 3\cos(4\pi t + \frac{\pi}{5}x - \pi)$

D: $y = 3\cos(4\pi t - \frac{9}{5}\pi - \pi) = 3\cos(4\pi t - \frac{14}{5}\pi)$

(2) ~~0点. $y = 3\cos(4\pi t +$~~

$y = 3\cos[4\pi t - \frac{\pi}{5}(x-5) - \pi]$

$x_0 = 5+9 = 14\,m$ $\quad y = 3\cos(4\pi t - \frac{14}{5}\pi)$

习题二 波动(三)

1. (A) 2. D 3. 2A 4. π

5. $A = \sqrt{A_1^2 + A_2^2 - 2A_1A_2\cos\Delta\varphi} \Rightarrow \cos\Delta\varphi = \frac{1}{2}$, $\Delta\varphi = \frac{\pi}{3}$ 或 $-\frac{\pi}{3} \pm 2k\pi$. ~~或 $-\frac{\pi}{3} \pm 2k\pi$~~

$\because \Delta\varphi = 0.02\pi x \quad \therefore x = 50(\frac{1}{3} + 2k)$ 或 $50(-\frac{1}{3} + 2k)$

6. $\lambda = uT = 0.2\,m$

设合振动为 $y = A\cos(2\pi t + \varphi)$

$\Delta\varphi = \frac{\pi}{2} - 10\pi(-0.15) = 2\pi \quad \therefore A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2} = 6\times10^{-3}\,m$

$$\tan\varphi = \frac{A_1\sin(-\frac{2\pi\cdot0.45}{0.2}) + A_2\sin(\frac{\pi}{2} - \frac{2\pi\cdot0.3}{0.2})}{A_1\cos(-\frac{2\pi\cdot0.45}{0.2}) + A_2\cos(\frac{\pi}{2} - \frac{0.3\cdot2\pi}{0.2})} = -1$$

$\therefore \varphi = -\frac{\pi}{2} \quad \therefore \quad y = 6\times10^{-3}(2\pi t - \frac{\pi}{2})$

习题二二 波动(四)

1. A　　2. C.　　3. Ea　　4. $x=(2k+1)\frac{\lambda}{4}$, $k=0,1,2\cdots$

5. (1) $y_2=0.05\cos\left[2\pi\left(\frac{t}{0.05}+\frac{x}{4}\right)\right]$

(2) 驻波: $y=y_1+y_2=0.1\cdot\cos 40\pi t\left(\cos\frac{\pi}{2}x\right)$

波节: $\left|\cos\frac{\pi}{2}x\right|=0$, $x=\pm 2k+1$, $k=0,1,2\cdots$

距原点最近: $1m$, $-1m$, $3m$, $-3m$