

6.3

a. 天线阵因子

$$AF = -e^{-jkd \cos \theta} - j + e^{-jkd \cos \theta} = -j [2 \sin(kd \cos \theta) + 1]$$

$$\therefore AF = 2 \sin(kd \cos \theta) + 1 = 2 \sin(\pi \cos \theta) + 1$$

b.  $\frac{1}{2} 2 \sin(\pi \cos \theta) = -1$

$$| \Rightarrow \pi \cos \theta = -\frac{\pi}{6}, -\frac{5}{6}\pi, \dots, \frac{7}{6}\pi, \frac{11}{6}\pi, \frac{19}{6}\pi$$

$$\theta_n = \cos^{-1}\left(\frac{x_n}{\pi}\right)$$

$$\theta_1 = \cos^{-1}\left(\frac{-\frac{\pi}{6}}{\pi}\right) = 99.59^\circ \quad \theta_2 = \cos^{-1}\left(\frac{-\frac{5}{6}\pi}{\pi}\right) = 146.44^\circ$$

6.7 (a) HPBW =  $60^\circ = \pi/3$  rad

$$\therefore \theta_n \approx 2 \left[ \frac{\pi}{2} - \cos^{-1}\left(\frac{1.391\lambda}{\pi Nd}\right) \right]$$

$$\therefore \frac{\pi}{3} \approx 2 \left[ \frac{\pi}{2} - \cos^{-1}\left(\frac{1.391\lambda}{\pi Nd}\right) \right]$$

$$\therefore \cos^{-1}\left(\frac{1.391}{\pi Nd}\right) = \frac{\pi}{3}, \text{ 解得 } N: 8.855 \approx 9$$

(b) FMBW =  $60^\circ = \pi/3$  rad

$$\therefore \frac{\pi}{3} = 2 \left[ \frac{\pi}{2} - \cos^{-1}\left(\frac{\lambda}{Nd}\right) \right] \quad \therefore \cos^{-1}\left(\frac{\lambda}{Nd}\right) = \frac{\pi}{3}$$

$$\therefore \frac{\lambda}{Nd} = \frac{1}{2}, \quad N = \frac{2\lambda}{d} = 20$$