



a.  $T = 4$

b.  $\omega_0 = \frac{2\pi}{T} = \frac{2\pi}{4} = \frac{\pi}{2}$

c.  $X[k] = \frac{1}{T} \int_0^T x(t) e^{-jk\omega_0 t} dt$

$$X[k] = \frac{1}{4} \int_{-1}^3 x(t) e^{-jk \cdot \frac{\pi}{2} t} dt$$

$$X[k] = \frac{1}{4} \left[ \int_{-1}^1 1 \cdot e^{-jk \frac{\pi}{2} t} dt + \int_1^3 0 \cdot e^{-jk \frac{\pi}{2} t} dt \right]$$

$$X[k] = \frac{1}{4} \left( \frac{1}{-jk \frac{\pi}{2}} \cdot e^{-jk \frac{\pi}{2} t} \Big|_{-1}^1 + 0 \right)$$

$$X[k] = \frac{1}{4 - jk \frac{\pi}{2}} \cdot (e^{-jk \frac{\pi}{2}} - e^{jk \frac{\pi}{2}})$$

$$X[k] = \frac{1}{-j2k\pi} \cdot 2j \sin(k \frac{\pi}{2})$$

$$X[k] = \frac{\sin(k \frac{\pi}{2})}{k \pi}$$

d.  $B[0] = X[0] = \lim_{k \rightarrow 0} \frac{\sin(k \frac{\pi}{2})}{k \pi} = \frac{1}{2}$

e.  $X[-k] = \frac{\sin(-k \frac{\pi}{2})}{-k \pi} = \frac{\sin(k \frac{\pi}{2})}{k \pi} = X[k]$

$$B[k] = X[k] + X[-k]$$

$$= \frac{\sin(k \frac{\pi}{2})}{k \pi} + \frac{\sin(k \frac{\pi}{2})}{k \pi}$$

$$= \frac{2 \sin(k \frac{\pi}{2})}{k \pi}$$

f. karena  $x[k] = x[-k] \rightarrow x[k]$  fungsi genap maka:

$$A[k] = j(x[k] - x[-k]) = 0$$

g. 
$$x(t) = B[0] + \sum_{k=-\infty}^{\infty} \{ B[k] \cos(k\omega_0 t) + A[k] \sin(k\omega_0 t) \}$$

$$x(t) = \frac{1}{2} + \sum_{k=-\infty}^{\infty} \left[ \frac{2 \sin(k \frac{\pi}{2})}{k \pi} \cos(k \frac{\pi}{2} t) + 0 \right]$$

$$x(t) = \frac{1}{2} + \sum_{k=-\infty}^{\infty} \frac{2 \sin(k \frac{\pi}{2})}{k \pi} \cos(k \frac{\pi}{2} t)$$
