PSD of $\cos(\omega_0 t)$

$$x_c(t) = \begin{cases} \cos(\omega_0 t) & t \in [-T/2, T/2) \\ 0 & \text{otherwise} \end{cases}$$

$$X_c(\omega) = \int_{-T/2}^{+T/2} \cos(\omega_0 t)\, e^{-j\omega t}\, dt$$

$$= \frac{1}{2}\int_{-T/2}^{+T/2} e^{-j(\omega-\omega_0)t}\, dt + \frac{1}{2}\int_{-\infty}^{+\infty} e^{-j(\omega+\omega_0)t}\, dt$$

$$= \frac{\sin(\omega-\omega_0)T/2}{\omega-\omega_0} + \frac{\sin(\omega+\omega_0)T/2}{\omega+\omega_0}$$

if $\omega \neq \omega_0$ and $-\omega \neq \omega_0$, then $X_c(\omega)$ is a finite number and $\lim_{T\to\infty} \frac{1}{T}|X_c(\omega)|^2 = 0$

Since the power is

$$P_x = \lim_{T\to\infty} \frac{1}{T}\int_{-T/2}^{T/2} |\cos(\omega_0 t)|^2\, dt = \lim_{T\to\infty} \frac{1}{T}\int_{-T/2}^{T/2} \left(\frac{1}{2} + \frac{1}{2}\cos(2\omega_0 t)\right) dt$$

$$= \frac{1}{2} + \lim_{T\to\infty} \frac{1}{T}\frac{1}{4\omega_0} \sin 2\omega_0 t \Big|_{-T/2}^{T/2} = 1/2$$

hence PSD