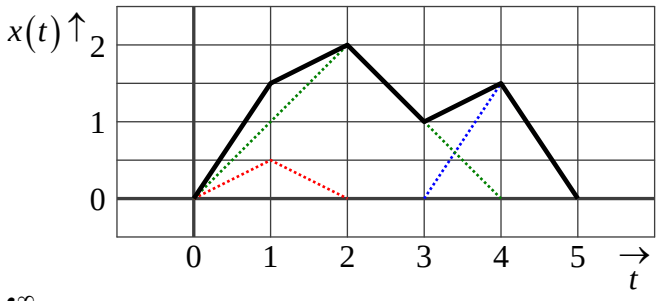
ANSWER KEY

Q.1 (a)



$$\int_{-\infty}^{\infty} x(t)\,dt = 6$$

(b) $z(t) = \frac{1}{2} y\left(-\left(\frac{t+2.5}{2.5}\right)\right)$

Q.2 (a) Fundamental frequency of $x(t) = \sqrt{3}$ rad/s $= \frac{\sqrt{3}}{2\pi}$ Hz

(b) DC value of $x(t) = 2$

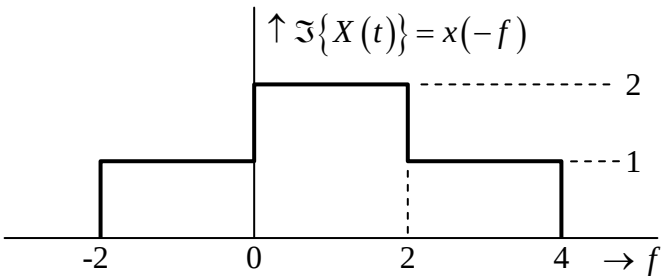
(c) $\begin{cases} c_6 = 4 - j3, \quad c_{\pm 2} = 1.5 \mp j2, \quad c_{\pm 1} = \mp j3.5, \quad c_0 = 2 \\ c_k = 0 \text{ for } k \neq 0, \ \pm 1, \ \pm 2, \text{ and } 6 \end{cases}$

(d) $P = 66$ W

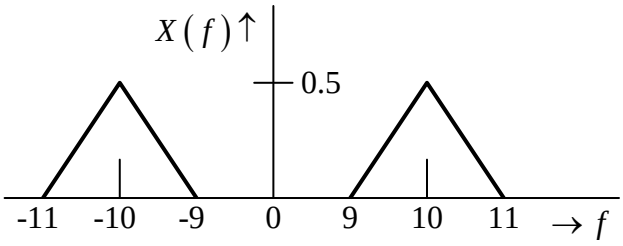
Q.3 (a) $\left(x(t) = \text{rect}\left(\frac{t+1}{2}\right) + \text{rect}\left(\frac{t+1}{6}\right) \right.$
$\left. X(f) = \left[2\text{sinc}(2f) + 6\text{sinc}(6f)\right] e^{j2\pi f} \right)$ or $\left(x(t) = \text{rect}\left(\frac{t}{4}\right) + \text{rect}\left(\frac{t+2}{4}\right) \right.$
$\left. X(f) = 4\text{sinc}(4f)\left[1 + e^{j4\pi f}\right] \right)$

(b) 1st-null bandwidth $= \frac{1}{4}$ Hz

(c)



Q.4 (a)



(b) $E_x(f) = \frac{1}{4}\text{tri}^2(f-10) + \frac{1}{4}\text{tri}^2(f+10)$

(c) $E = \frac{1}{3}$ J

(d) $f_c = 10$ Hz and $B = 0.59$ Hz