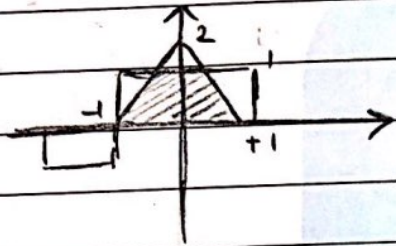
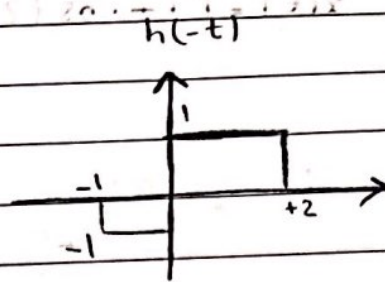
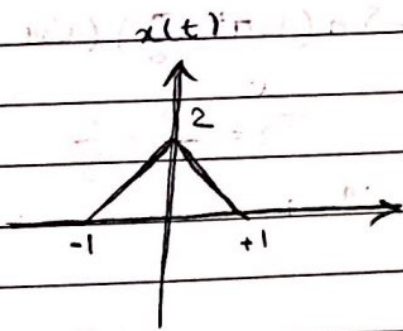
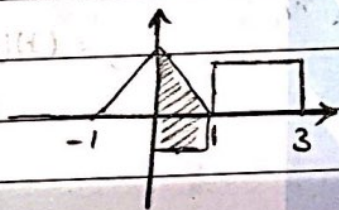


جواب سوال 1: الف)



در $t = -1$ خروجی $y(t)$ به نسبت مقدار خود میرسد



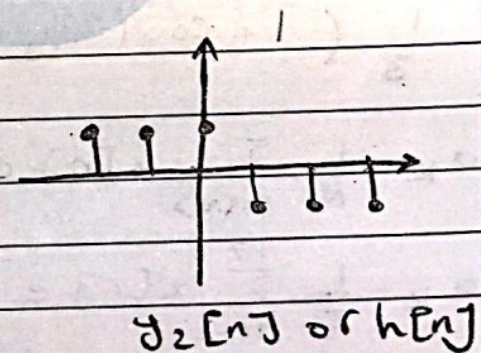
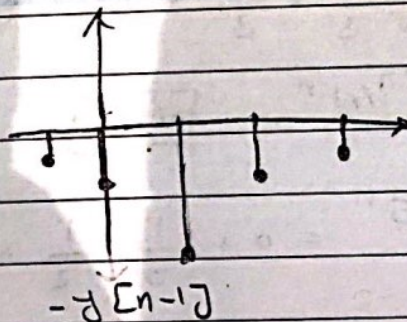
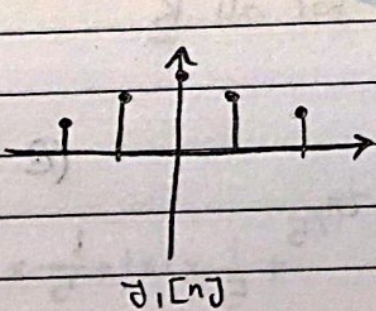
$$\rightarrow t=1 \rightarrow 2 \times 1 \times \frac{1}{2} - 1 \times 1 = 0$$

$$x_1[n] = u[n] \rightarrow y_1[n] =$$

$$x_2[n] = \delta[n] = u[n] - u[n-1] = x_1[n] - x_1[n-1]$$

جواب سوال 2: ب)

$$\Rightarrow y_2[n] = y_1[n] - y_1[n-1]$$



جواب سوال 2:

$$x(t) = [1 + \cos(2\pi t)] + \sin(10\pi t + \frac{\pi}{6})$$

$$T_1 = \frac{2\pi}{2\pi} = 1$$

$$T_2 = \frac{2\pi}{10\pi} = \frac{1}{5}$$

$$\rightarrow T=1, \omega_0 = 2\pi$$

$$1 + \frac{e^{j2\pi t} + e^{-j2\pi t}}{2} + \frac{e^{j(10\pi t + \pi/6)} - e^{-j(10\pi t + \pi/6)}}{2j}$$

$$= 1 + \frac{1}{2} e^{j(2\pi t)} + \frac{1}{2} e^{-j(2\pi t)} + \frac{1}{2j} e^{j(\pi/6)} e^{j(10\pi t)} - \frac{1}{2j} e^{-j(\pi/6)} e^{j(10\pi t)}$$

$$a_0 = 0$$

$$2\pi = k2\pi \rightarrow k=1 \rightarrow a_1 = \frac{1}{2}$$

$$-2\pi = k2\pi \rightarrow k=-1 \rightarrow a_{-1} = \frac{1}{2}$$

$$10\pi = k \cdot 2\pi \rightarrow k=5 \rightarrow a_5 = \frac{1}{2j} e^{j(\pi/6)}$$

$$-10\pi = k \cdot 2\pi \rightarrow k=-5 \rightarrow a_{-5} = -\frac{1}{2j} e^{-j(\pi/6)}$$

$$a_k = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-jk \frac{2\pi}{N} n}$$

$$N=3$$

(ب)

$$a_k = \frac{1}{3} \sum_{n=-1}^{+1} x[n] e^{-jk \frac{2\pi}{3} n} = \frac{1}{3} \times \frac{1}{2} \times e^{+jk \frac{2\pi}{3}} + \frac{1}{2} \times 1 \times 1 + \frac{1}{3} \times \frac{1}{2} \times e^{-jk \frac{2\pi}{3}}$$

$$= \frac{1}{3} (1 + \cos(2\pi/3 k)) \text{ or } \frac{1}{3} + \frac{1}{3} \cos(2\pi/3 k) \text{ for all } k$$

$$a_k = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-jk \frac{2\pi}{N} n}$$

$$N=5$$

(ج)

$$a_k = \frac{1}{5} \sum_{n=-2}^{+2} x[n] e^{-jk \frac{2\pi}{5} n} = 0 + \frac{1}{5} \times \frac{1}{2} \times e^{jk \frac{2\pi}{5}} + \frac{1}{5} \times 1 \times 1 + \frac{1}{5} \times \frac{1}{2} \times e^{-jk \frac{2\pi}{5}}$$

$$a_k = \frac{1}{5} (1 + \cos(2\pi/5 k)) \text{ or } \frac{1}{5} + \frac{1}{5} \cos(2\pi/5 k) \text{ for all } k$$

جواب سؤال 3: أ

$$T = 6$$

$$a_k = \frac{1}{T} \int_{\langle T \rangle} x(t) \cdot e^{-jk\omega_0 t} dt \quad \omega_0 = \frac{2\pi}{T} = \frac{2\pi}{6} = \frac{\pi}{3}$$

$$a_k = \frac{1}{6} \int_{-2}^{-1} e^{-jk(\pi/3)t} dt + \frac{1}{6} \int_1^2 e^{-jk(\pi/3)t} dt + 0$$

$$= \frac{1}{6} \left[\frac{1}{-jk(\pi/3)} e^{-jk(\pi/3)t} \right]_{-2}^{-1} - \frac{1}{6} \left[\frac{1}{-jk(\pi/3)} e^{-jk(\pi/3)t} \right]_1^2$$

$$= -\frac{1}{2jk\pi} \left[e^{j(\pi/3)k} - e^{j(2\pi/3)k} - e^{-j(2\pi/3)k} + e^{-j(\pi/3)k} \right]$$

$$= \frac{-1}{k\pi} [\sin(2\pi/3 k) - \sin(\pi/3 k)]$$

$$\Rightarrow x(t) = \sum_k a_k e^{jk\omega_0 t}, \quad \omega_0 = \pi/3, \quad a_k = \frac{\sin(2\pi/3 k) - \sin(\pi/3 k)}{\pi k}$$