Assignment 6

The due date for submitting this assignment has passed. **Due on 2016-09-05, 23:30 IST.**

Submitted assignment

1) For the IIR filter shown in Fig. 1, what is the input-output relation?  

![IIR Filter Diagram](image)

Figure 1: Q.1

(a) \( y(n) = \frac{1}{2} y(n-1) - y(n-2) + \frac{1}{2} y(n-3) = x(n) - \frac{1}{2} x(n-2) + x(n-3), \)

(b) \( y(n) = \frac{1}{2} y(n-1) + y(n-2) - \frac{1}{2} y(n-3) = x(n-1) + \frac{1}{2} x(n-2) - x(n-3), \)

(c) \( y(n) = \frac{1}{2} y(n-1) - y(n-2) - \frac{1}{2} y(n-3) = x(n) - \frac{1}{2} x(n-2) + x(n-3), \)

(d) \( y(n) = \frac{1}{2} y(n-1) + y(n-2) + \frac{1}{2} y(n-3) = x(n) + \frac{1}{2} x(n-2) + x(n-3). \)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(a) \( y(n) = \frac{1}{2} y(n-1) - y(n-2) + \frac{1}{2} y(n-3) = x(n) - \frac{1}{2} x(n-2) + x(n-3), \)
2) For the digital filter shown in Fig. 2, the impulse response $h(n)$ is given by

$$h(n) = \begin{cases} 1, & n = 0 \\ -1, & n = 1 \\ 2, & n = 2 \\ -2, & n = 3 \\ 2, & n = 4 \\ -1, & n = 5 \\ 1, & n = 6 \\ 0, & n \neq \{0, 1, 2, 3, 4, 5, 6\} \end{cases}$$

Figure 2: Q.2

- (a) $1, -1, 2, -2, 2, -1, 1$
- (b) $1/2, -1/2, 1, -1$
- (c) $1/2, -1/2, 1, -1, -1, 1, -1/2, 1/2$
- (d) $0, 0, 0, 0, 1/2, -1/2, 1, -1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c) $1/2, -1/2, 1, -1, -1, 1, -1/2, 1/2$

3) An analog signal $x_a(t)$ is shown in Fig. 3. Then, $x_a(2t - 1)$ is given by

Figure 3: Q.3
(a)

Figure 4: Question 3: Option a

(b)

Figure 5: Question 3: Option b

(c)

Figure 6: Question 3: Option c

(d) none of (a), (b), (c).

No, the answer is incorrect.
Score: 0
Accepted Answers:
4) An analog signal $x_a(t)$ is shown in Fig. 7. Then, the analog convolution $x_a(t) * x_a(t)$ is given by

![Figure 7: Q.4](image_url)
Figure 8: Question 4: Option a
(b)

Figure 9: Question 4: Option b
No, the answer is incorrect.
Score: 0
Accepted Answers:
A sequence \( x(n) = 2\cos\left(\frac{\pi}{4}n + \frac{\pi}{3}\right) + \sin\left(\frac{3\pi}{4}n\right) \) is passed through a linear phase filter with transfer function \( H(e^{j\omega}) \), given as

\[
H(e^{j\omega}) = \begin{cases} 
Ae^{-j2\omega}, & \text{for } -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2}, \\
0, & \text{for } -\pi \leq \omega < -\frac{\pi}{2}, \text{ and } \frac{\pi}{2} < \omega \leq \pi.
\end{cases}
\]

The filter output will be given by

- (a) \( 2A \cos\left(\frac{\pi}{4}(n + 2) + \frac{\pi}{3}\right) + A \sin\left(\frac{3\pi}{4}(n + 2)\right) \),
- (b) \( 2A \cos\left(\frac{\pi}{4}(n - 2) + \frac{\pi}{3}\right) \),
- (c) \( 2A e^{-j\pi/2}\cos\left(\frac{\pi}{4}n + \frac{\pi}{3}\right) \),
- (d) None of the above.

No, the answer is incorrect.

Score: 0

Accepted Answers:
- (b) \( 2A \cos\left(\frac{\pi}{4}(n - 2) + \frac{\pi}{3}\right) \),