Assignment 3

The due date for submitting this assignment has passed. **Due on 2016-08-15, 23:30 IST.**

Submitted assignment

1) Consider the difference equation \( y(n) = \frac{1}{2} y(n-1) + x(n) \) with an initial condition \( y(-1) = 1 \). Find the general response of the system.

   - (a) \( y(n) = \frac{1}{2^n} + x(n) \)
   - (b) \( y(n) = \frac{1}{2^n} + x(n) \)
   - (c) \( y(n) = \frac{1}{2^n} + \sum_{k=0}^{n} \frac{1}{2^{n-k}} x(k) \)
   - (d) \( y(n) = \frac{1}{2^{n+1}} + \sum_{k=0}^{n} \frac{1}{2^{n-k}} x(k) \)

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (d) \( y(n) = \frac{1}{2^{n+1}} + \sum_{k=0}^{n} \frac{1}{2^{n-k}} x(k) \).

2) A stable LTI system is characterized by the system function \( H(z) = \frac{1}{(1 - 2^{-1})(1 - z^{-1})} \). Determine the ROC (region of convergence).

   - (a) \( |z| < \frac{1}{2} \)
   - (b) \( |z| > \frac{1}{2} \)
   - (c) \( \frac{1}{2} < |z| < 2 \)
   - (d) \( |z| < \frac{1}{2} \) and \( |z| > 2 \)

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (c) \( \frac{1}{2} < |z| < 2 \)

3) A causal LTI system has its input \( x(n) \) and output \( y(n) \) related by the linear constant-coefficient difference equation:

\[ y(n) + \sum_{k=1}^{10} a_k y(n-k) = x(n) + \beta x(n-1) \]

Evaluate \( h(0) \).

   - (a) \( h(0) = 0 \)
(b) $h(0) = 1$

(c) $h(0) = \frac{1 + \beta}{1 + \sum_{k=1}^{M} \alpha_k}$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b) $h(0) = 1$

4) Given $h(n) = Z^{-1}\left(H(z)\right)$ is stable, determine $h(n)$, the inverse $z$-transform of the system function $H(z) = \frac{\beta}{z - \frac{3}{4} - \frac{1}{2}z^{-1}}$.

(a) $4(-4)^n u(-n - 1) + 4\left(\frac{1}{2}\right)^n u(n)$

(b) $4\left(-\frac{1}{2}\right)^n u(-n - 1) - 4\left(\frac{1}{2}\right)^n u(-n - 1)$

(c) $-4\left(-\frac{1}{4}\right)^n u(n) + 4\left(\frac{1}{2}\right)^n u(n)$

(d) None of (a), (b), (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c) $-4\left(-\frac{1}{4}\right)^n u(n) + 4\left(\frac{1}{2}\right)^n u(n)$

5) If $H(e^{j\omega})$ is as shown in Figure 1, determine $G(e^{j\omega}) = H(e^{j2\omega})$.

![Figure 1: Q5](https://onlinecourses.nptel.ac.in/noc16_ec13/unit?unit=21&assessment=27)
Figure 2: Q5

Figure 3: Q5
Figure 4: Q5

- (a) Figure 2
- (b) Figure 3
- (c) Figure 4
- (d) None of (a), (b), (c).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c) Figure 4