

**ECE-320,  
Quiz #5**

For all of the following problems, assume we are using a two-sided z-transform.

1) The z-transform of a sequence  $x(n)$  is defined as

$$\text{a) } X(z) = \sum_{k=-\infty}^{\infty} x(k)z^k \quad \text{b) } X(z) = \sum_{k=-\infty}^{\infty} x(k)z^{-k}$$

2) The z-transform of the sequence  $x(n) = 3^n u(n)$  is

$$\text{a) } \frac{z}{3-z} \quad \text{b) } \frac{1}{z-3} \quad \text{c) } \frac{1}{3-z} \quad \text{d) } \frac{z}{z-3} \quad \text{e) none of these}$$

3) The z-transform of  $x(n) = u(n)$  is

$$\text{a) } \frac{z}{z-1} \quad \text{b) } \frac{1}{z-1} \quad \text{c) } \frac{1}{1-z} \quad \text{d) } \frac{z}{1-z} \quad \text{e) none of these}$$

4) The z-transform of  $x(n) = u(n-1)$  is

$$\text{a) } \frac{z}{z-1} \quad \text{b) } \frac{1}{z-1} \quad \text{c) } \frac{1}{1-z} \quad \text{d) } \frac{z}{1-z} \quad \text{e) none of these}$$

5) The z-transform of the sequence  $x(n) = \delta(n)$  is

$$\text{a) } 1 \quad \text{b) } z \quad \text{c) } z^{-1} \quad \text{d) } 0 \quad \text{e) none of these}$$

6) The z-transform of the sequence  $x(n) = \delta(n-1)$  is

$$\text{a) } 1 \quad \text{b) } z \quad \text{c) } z^{-1} \quad \text{d) } 0 \quad \text{e) none of these}$$

7) The z-transform of the sequence  $x(n) = 3^{n+1} u(n)$  is

$$\text{a) } \frac{3z}{z-3} \quad \text{b) } \frac{1}{3} \frac{z}{z-3} \quad \text{c) } \frac{1}{3} \frac{z^2}{z-3} \quad \text{d) } \frac{3z^2}{z-3} \quad \text{e) none of these}$$

8) The z-transform of the sequence  $x(n) = 3^n u(n-1)$  is

- a)  $\frac{3}{z-3}$     b)  $\frac{3z}{z-3}$     c)  $\frac{9z}{z-3}$     d)  $\frac{9}{z-3}$     e) none of these

9) The z-transform of the sequence  $x(n) = 3^n u(n+1)$  is

- a)  $\frac{3z^2}{z-3}$     b)  $\frac{1}{3} \frac{z}{z-3}$     c)  $\frac{1}{9} \frac{z^2}{z-3}$     d)  $\frac{1}{3} \frac{z^2}{z-3}$     e) none of these

10) The z-transform of the sequence  $x(n) = 2^n u(n)$  converges provided

- a)  $2 < |z|$     b)  $|z| < 2$

11) The z-transform of the sequence  $x(n) = \left(\frac{1}{3}\right)^n u(n-1)$  converges provided

- a)  $\frac{1}{3} < |z|$     b)  $|z| < \frac{1}{3}$

12) For z-transform  $Y(z) = \frac{z^{-1}}{z-2}$ , the inverse z-transform is

- a)  $y(n) = 2^n u(n)$     b)  $y(n) = 2^{n-2} u(n-2)$     c)  $y(n) = 2^{n+2} u(n+2)$     d)  $y(n) = 2^{n-2} u(n)$     e) none of these

13) For z-transform  $Y(z) = \frac{1}{z-2}$ , the inverse z-transform is

- a)  $y(n) = \frac{1}{2} \delta(n) - \frac{1}{2} 2^n u(n)$     b)  $y(n) = -\frac{1}{2} \delta(n) + \frac{1}{2} 2^n u(n)$

14) Which of the following transfer functions represents an (asymptotically) unstable systems? (circle all of them)

- a)  $G(z) = \frac{z}{z+0.8}$     b)  $G(z) = \frac{z}{z-0.8}$     c)  $G(z) = \frac{z}{z+1.2}$     d)  $G(z) = \frac{z}{z-1.2}$

15) Which of the following systems will have a smaller settling time?

- a)  $G(z) = \frac{z}{z-0.9}$     b)  $G(z) = \frac{z}{z-0.7}$     c)  $G(z) = \frac{z}{z+0.5}$     d)  $G(z) = \frac{z}{z+0.1}$