

Tutorial Questions: z-Transforms

1. Find the z -Transform of a step function:

$$x[n] = \begin{cases} 1 & \text{for } n \geq 0 \\ 0 & \text{elsewhere} \end{cases}.$$

2. Find the z -Transform of a square pulse:

$$x[n] = \begin{cases} 0.2 & \text{for } 0 \leq n < 5 \\ 0 & \text{elsewhere} \end{cases}.$$

3. Find the signal corresponding to the z -transform:

$$X(z) = \frac{z}{z - 0.5}.$$

4. Find the signal corresponding to the z -Transform:

$$X(z) = \frac{z^2 - 0.2}{z(z - 0.2)}.$$

5. Decompose the following function into partial fractions:

$$\frac{1}{(z + 3)(z - 2)}$$

6. Decompose the following function into partial fractions: (cover-up method)

$$\frac{z}{(z + 3)(z - 2)}$$

7. Find the inverse z -Transform of:

$$X(z) = \frac{1}{(z + 3)(z - 2)}$$

8. Find the inverse z -Transform of:

$$X(z) = \frac{z}{(z + 3)(z - 2)}$$

9. Use algebraic long division to find the coefficients of the following transfer function:

$$H(z) = \frac{z}{z^2 + z - 2}$$

10. Find the inverse z -Transform of:

$$X(z) = \frac{0.5z}{z^2 - z + 0.5}$$

11. What are the poles and zeros for the following z -Transform? Sketch them on a z -plane diagram.

$$X(z) = \frac{1}{(z - 0.7 + 0.8j)(z - 0.7 - 0.8j)}$$

12. What does BIBO stable mean and is the function (from previous question) BIBO stable?

13. What are the poles and zeros for the following z -Transform? Sketch them on a z -plane diagram.

$$X(z) = \frac{1}{(z - 0.5 + 0.5j)(z - 0.5 - 0.5j)}$$

Is it BIBO stable?

14. When is the system with the following transfer function BIBO stable?

$$H(z) = \frac{1}{z - a}.$$

15. Find the inverse z -Transform of:

$$H(z) = \frac{1}{z - 0.4}$$

16. What effect (in the time domain) does adding a zero at the origin have on the z -Transform in the previous equation?