

MAT 321

Quiz 2

Spring 2020

Unless otherwise indicated, all signals and systems will be assumed to be discrete time, with time values given as all integer multiples of one sample.

1. Consider the accumulator system:

$$y_t = \sum_{k=-\infty}^t x_k.$$

Which of the following input signals will have at least one output undefined?

- i) $x_t = (-1)^t, -\infty < t < \infty.$ ii) $x_t = \frac{(-1)^t}{t}, -\infty < t < \infty.$ iii) $x_t = (-1)^t, t \geq 0, x_t = 0, t < 0.$
 a) i) and ii) only b) ii) and iii) only c) iii) only d) ii) only e) i) only

Correct Answer: i) only or i) and ii) only

2. Same system as in the previous problem. Which of the following input signals will have unbounded output?

- i) $x_t = \frac{(-1)^t}{t}, -\infty < t < \infty.$ ii) $x_t = \frac{(-1)^t}{t}, t \geq 0, x_t = 0, t < 0.$ iii) $x_t = \frac{1}{t}, t > 0, x_t = 0, t \leq 0.$
 a) i) and ii) only b) ii) and iii) only c) iii) only d) ii) only e) i) only

Correct Answer: all of them.

3. Same system as in the previous problem. What is the transfer function of this system?

- a) $\frac{1}{1-z^{-1}}$ b) $\frac{1}{1-z^{-2}}$ c) $\frac{1}{(1-z^{-1})^2}$ d) $\frac{1}{1-2z^{-1}+z^{-2}}$ e) $1-z^{-1}$

Correct Answer: $\frac{1}{1-z^{-1}}$

4. Which of the following signals are absolutely summable? (Recall that this means that the sum of the absolute values of all the signal values converges.) Assume that each signal is zero for $t \leq 0$.

- i) $x_t = \frac{(-1)^t}{t},$ ii) $x_t = 2^{-t},$ iii) $x_t = 2^t.$
 a) i) and ii) only b) ii) and iii) only c) iii) only d) ii) only e) i) only

Correct Answer: ii) only

5. Which of the following impulse responses will give a system which is BIBO stable? Assume that each signal h_t is zero for $t \leq 0$.

- i) $h_t = \frac{(-1)^t}{t^2},$ ii) $h_t = (1.1)^{-t},$ iii) $h_t = 1.$
 a) i) and ii) only b) ii) and iii) only c) iii) only d) ii) only e) i) only

Correct Answer: i) and ii) only