
Time: 15 mins

Name:

Std. Number:

Quiz 1 (Vector Spaces)

Questions

1. define continuous-time, discrete-time and digital signal.
2. What is the difference between the following spaces?
 - Vector space
 - Banach space
 - Hilbert Space
3. Let $B = \{b_1, b_2, \dots, b_m\}$ be a subset of \mathbb{R}^n which are pairwise orthogonal and none of them is zero. prove that they are linearly independent.

Solutions

1. **continuous-time** A function with continuous domain and range
discrete-time A function with discrete domain and continuous range
digital A function with discrete domain and range
2. A vector space V is complete if every Cauchy sequence in V , converges to a vector in V . A complete vector space equipped with a norm is called a Banach space. A Banach space with an inner product is a Hilbert space.
3. Assume m variables $\alpha_1, \alpha_2, \dots, \alpha_m$ exist (at least one of them is not zero) such that $\alpha_1 b_1 + \alpha_2 b_2 + \dots + \alpha_m b_m = 0$ so $\langle b_i, \alpha_1 b_1 + \alpha_2 b_2 + \dots + \alpha_m b_m \rangle = \alpha_i \|b_i\|^2 = 0 (\alpha_i \neq 0) \Rightarrow \|b_i\| = 0$ which is against hypothesis.