

ECE 603 - Probability and Random Processes, Fall 2009

Homework #1

Due: 10/2/09, in class

1. Show:

- (a) The union of two countable sets A_1 and A_2 is countable.
- (b) The (countable) union of countable sets A_1, A_2, A_3, \dots is countable.

2. Determine whether the following sets are finite, countably infinite, or uncountable:

- (a) The set A of all functions $f : \{0, 1\} \rightarrow \mathcal{Z}_+$
- (b) The set B_n of all functions $f : \{1, 2, \dots, n\} \rightarrow \mathcal{Z}_+$
- (c) The set $C = \bigcup_{n \in \mathcal{Z}_+} B_n$.
- (d) The set D of all functions $f : \mathcal{Z}_+ \rightarrow \{0, 1\}$.
- (e) The set E of all functions $f : \mathcal{Z}_+ \rightarrow \mathcal{Z}_+$.
- (f) The set F of all functions $f : \mathcal{Z}_+ \rightarrow \{0, 1\}$ such that $f(n) = 0$ for $n \geq N$, where N is some integer.
- (g) The set G of all functions $f : \mathcal{Z}_+ \rightarrow \mathcal{Z}_+$ such that $f(n) = 1$ for $n \geq N$, where N is some integer.
- (h) The set H of all functions $f : \mathcal{Z}_+ \rightarrow \mathcal{R}$ such that $f(n) = 1$ for $n \geq N$, where N is some integer.
- (i) The set I of all two-element subsets of \mathcal{Z}_+ .
- (j) The set J of all finite subsets of \mathcal{Z}_+ .