eMasters in Communication Systems, IITK

EE901: Probability and Random Processes

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**Assignment – 1 - Question Set -1 - Solution**

**Q1. A fair coin is tossed thrice. If we are interested in all outcomes. Find the sample space.**

**If we are only interested in total number of heads, find the sample space.**

**Solution:**

Let’s say H – Heads, T – Tails

Since each coin toss has two possible outcomes (H or )

🡺 All outcomes for 3 tosses =

**All outcomes sample space:**

All heads – HHH

Two heads and one tail – HHT, HTH, THH

One head and two tails – HTT, THT, TTH

All tails - TTT

**All outcomes sample space**

**Total number of heads sample space**

From the total sample space, we can see that there can be :

where the number represents the total number of heads

**Q2:** **Consider a dice roll experiment. Let A denote the event that an odd number occurs. Let B denote the event that an even number occurs. Let C denote the event that a number less than 3 occurs. Now compute and . Compute.**

**Solution:**

A die roll can result in one of the possible outcome numbers =

Odd number set =

Even number set = B =

Less than 3 set = C =

**Q3:** Let = (0; 1), which among the below are algebra?

**Solution:**

**Q4: Let . Obtain a -algebra which contains at least**

**Solution:**

Let’s construct the sigma algebra containing at least set A and set B

* Empty and entire set -
* The asked sets themselves -
* The complements of sets A and B -
* The union of sets of A and B -

**Q5:** A computer picks a positive integer randomly. The probability that a number *i* appears is given as . Compute the value of c. Let A denote the event that an even number occurs. Let B denote the event that a number less than 10 occurs.

What is the probability of event A and ? What is probability of ?

**Solution:**

By probability axioms, where *i* is a positive integer

Solving above for C,

Per Basel problem, the sum 1 can be written as