Assignment 2 for **M.Tech DSP - AVD612**

Question 1 (3 marks): A box contains three marbles one red, one green, and one blue. Consider an experiment that consists of taking one marble from the box, then replacing it in the box and drawing a second marble from the box. Describe the sample space. Repeat for the case in which the second marble is drawn without first replacing the first marble.

Question 2 (3 marks): An experiment consists of tossing a coin three times. What is the sample space of this experiment? Which event corresponds to the experiment resulting in more heads than tails?

Question 3 (3 marks): Suppose $(\Omega, \mathbb{F}, \mathbb{P})$ is the probability space for an experiment. Let E and F be two events. Show that the probability that exactly one of the events E or F occurs is equal to $\mathbb{P}(E) + \mathbb{P}(F) - 2\mathbb{P}(EF)$.

Question 4 (3 marks): Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed n times. What are the possible values of X ? If the coin is assumed fair, for n = 3, what are the probabilities associated with the values that X can take on?

Question 5 (3 marks): A total of 4 buses carrying 148 students from the same school arrive at a football stadium. The buses carry, respectively, 40, 33, 25, and 50 students. One of the students is randomly selected. Let X denote the number of students that were on the bus carrying this randomly selected student. One of the 4 bus drivers is also randomly selected. Let Y denote the number of students on her bus. Compute the expectations of X and Y.