PROBABILITY AND STATISTICS (MTH-202)

16/01/2019

Name: ____________________

Registration number: ____________________

Time: 15 minutes | QUIZ-I | Maximum Marks: 4

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1. Three distinct coins are flipped simultaneously. Let H_i (for $i = 1, 2, 3$) denote the event that i^{th} coin shows Heads.

   - Describe the sample space. What is the size of event H_1?
   - Write the event $E = \{\text{All coins land Tails}\}$ in terms of H_i's.

   [2]

   Solution:

   - Sample space $\Omega = \{(X_1, X_2, X_3) : X_i \in \{\text{Heads, Tails}\}\}$.

     Note that $H_1 = \{(H, H, H), (H, T, H)(H, H, T), (H, T, T)\}$, so $|H_1| = 4$.

   - $E = H_1^c \cap H_2^c \cap H_3^c$ or $E = (H_1 \cup H_2 \cup H_3)^c$.

2. Let A, B be events in a sample space Ω. Prove that if $P(A) = P(B) = 0$, then $P(A \cup B) = 0$. [2]

   Solution: Since $A \cap B \subseteq A, B$, $P(A \cap B) \leq P(A), P(B) = 0$. But from axioms of probability, we know that $0 \leq P(A \cap B) \leq 1$, so $P(A \cap B) = 0$. This implies $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0$.

   Or,

   Follows immediately from

   $$P(A \cup B) \leq P(A) + P(B) = 0$$

   and the fact that $0 \leq P(A \cup B) \leq 1$.