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SCHOOL OF ADVANCED SCIENCES

Fall Semester 2024-2025

Digital Assignment 2

Programme Name & Branch	**: M.Sc. & Data Science**
Course Name & code	**: Probability and Distribution Models & PMDS502L**
Faculty Name	**: Dr. Jisha Francis**
Due Date & Max. Marks	**: 25 October, 2024 & 10 Marks**

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1. The complexity of arrivals and departures of planes at an airport is such that computer simulation is often used to model the "ideal" conditions. For a certain airport with three runways, it is known that in the ideal setting, the following are the probabilities that the individual runways are accessed by a randomly arriving commercial jet:

$$\text{Runway 1: } p_1 = \frac{2}{9}, \quad \text{Runway 2: } p_2 = \frac{1}{6}, \quad \text{Runway 3: } p_3 = \frac{11}{18}.$$

   (a) Explain why this is a multinomial experiment.

   (b) What are the key components of this experiment? Define n, k, and p_i.

   (c) What is the probability that 6 randomly arriving airplanes are distributed in the following fashion:

   - Runway 1: 2 airplanes,
   - Runway 2: 1 airplane,
   - Runway 3: 3 airplanes.

2. The probabilities are 0.4, 0.2, 0.3, and 0.1, respectively, that a delegate to a certain convention arrived by air, bus, automobile, or train. What is the probability that among 9 delegates randomly selected at this convention, 3 arrived by air, 3 arrived by bus, 1 arrived by automobile, and 2 arrived by train?