National University

of Computer & Emerging Sciences

Applied Physics (NS-1001) **Quiz # 3** **Fall 2025**

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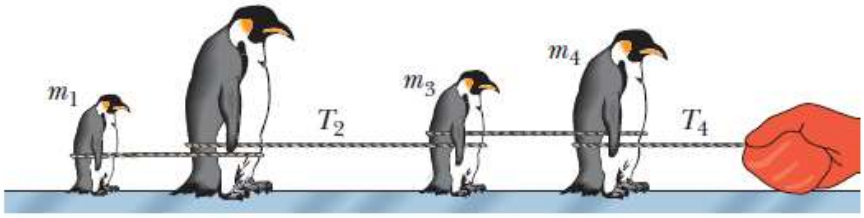
Section: BCS-B **CLO4** **Date: 27-10-2025**

Q.1: Figure shows four penguins that are being playfully pulled along very slippery (frictionless) ice by a curator. The masses of three penguins and the tension in two of the cords are m_1 = 12 kg, m_3 = 15 kg, m_4 = 20 kg, T_2 = 111 N, and T_4 = 222 N. Find the penguin mass m2 that is not given. (10M)



Solution:

54. First, we consider all the penguins (1 through 4, counting left to right) as one system, to which we apply Newton's second law:

$$T_4 = (m_1 + m_2 + m_3 + m_4)a \;\Rightarrow\; 222\text{N} = (12\text{kg} + m_2 + 15\text{kg} + 20\text{kg})a.$$

Second, we consider penguins 3 and 4 as one system, for which we have

$$T_4 - T_2 = (m_3 + m_4)a$$
$$111\text{N} = (15\text{ kg} + 20\text{kg})a \;\Rightarrow\; a = 3.2\text{ m/s}^2.$$

Substituting the value, we obtain $m_2 = 23$ kg.