SAKARYA UNIVERSITY
FACULTY OF
ENGINEERING/SCIENCE
2025-2026 FALL SEMESTER
PHYSICS-I LABORATORY
EXPERIMENT REPORT

Department: **Name Surname- Signature:**

Group Number:

EXPERIMENT NO 5

EXPERIMENT TITLE : ROTATIONAL MOTION

OBJECTIVE OF THE EXPERIMENT *(5 points)*:

THEORY OF THE EXPERIMENT *(9 points)*:

1. Define **angular velocity**, **angular acceleration**, and **angular frequency**.

2. Write the mathematical equations relating **angular velocity** to **linear velocity**, **angular acceleration** to **linear acceleration**, and **angular frequency** to **linear frequency.**

3. Define **moment of inertia** and **inertia moment**. State their mathematical equations.

EXPERIMENTAL SETUP:

1. **Draw the setup used in the experiment .*(3 points)***

2. **Write the names of the materials used in the experiment and briefly explain them**. ***(3 puan)***

PROCEDURE OF THE EXPERIMENT:

Explain the steps of the experiment procedure completely and sequentially. ***(5 points)***

MEASUREMENTS AND CALCULATIONS

1) Determine the position of the traces by taking the direction of motion as the positive **y** direction. Then, record the position of each trace and the time it takes for mass **m** to reach that position in the table below.. ***(5 points)***

Table 1

Point	y (cm)	t (sn)	t^2 (sn^2)

2) Using the data from the table, plot the position versus the square of time (**y-t^2**) graph**.** Calculate the **linear acceleration** of the motion using the slope of this graph. ***(15 points)***

3) After finding the angle ϕ that the air table makes with the horizontal, and then calculate the angular acceleration the equation $\alpha = \frac{2m(g\sin\phi - a)}{MR}$ using the relation $\alpha = \frac{a}{R}$ calculate the angular acceleration again and compare the values obtained. ***(10 points)***

4) Compare the tension in the string calculated from $T = m(g\sin\varphi - a)$ ve $T = \frac{MR\alpha}{2}$ ***(10 points)***

5) Calculate the moment of inertia of the mass M disk in two ways, using both the equation $I = \frac{RT}{\alpha}$ and the equation $I = \frac{MR^2}{2}$. Then, compare these values. ***(10 points)***

6) Find the angular formula $w = \alpha\, t_{son} = \frac{2m(g\sin\phi - a)t_{son}}{MR}$, and the final linear velocity of the mass m using the relationship ***v=R w.*** ***(10 points)***

7) Show that the total energy is conserved using the equation $-mgd\sin\phi + \frac{1}{2}mv^2 + \frac{1}{2}Iw^2 = 0$

(Take d =y_{final}). *(10 points)*

8) Interpret the results obtained in the experiment. ***(5 points)***