**Round 1- Dynamics of Machine Lab**

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### Department: Mechanical Engineering

### Lab Submission Number: 143

### Discipline: Mechanical Engineering

### Name of the Lab: Dynamics of Machine Lab

### Name of experiment: Disc Type Flywheel

### Experiment Number: 8

### FOCUS AREA: Experimental Analysis Methods

**About the Experiment:**

Disc type flywheel is a simple type of flywheel also called circular disc. In this the mass of the flywheel is uniformly distributed throughout the radius. In this experiment disc type flywheel which is mounted on an axle, on the axle a small mass (bob) is tied with a thread and then the bob is released form rest. Now, we have to calculate the time in which the mass will descend certain height H. The calculation of time will be done by first finding out the angular acceleration using equation (1) and the using equation of motion i.e. equation (2) to find out the time taken to descend the mass.

So going with the calculation, equating the torque

I×α=m×g×r    -------------------- (1)

From here we can calculate α,

After that using equation of motion, we can calculate the time,

θ=ω0×t+0.5×α×t2   --------------- (2)

**1. Learning Objectives and Cognitive Level**

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| --- | --- | --- | --- |
| **S.No** | **Learning Objectives** | **Cognitive level** | **Action verbs** |
| 1.Student will be able to: | State the propose of flywheel and what is its basic applications | Recall | State |
| 2.Student will be able to: | Describe the basic structure of Disc type flywheel and how to differentiate with other type of flywheel | Understand | Describe |
| 3. Student will be able to: | Understand the condition of principal stresses in the rotating disc | Understand | Understand |
| 5.Student will be able to: | Predict the behavior of disc type flywheel when its rotating | Apply | Predict |
| 6.Student will be able to: | Examine the time in which the mass will descend certain height H. | Analyze | Examine |
| 7.Student will be able to: | Evaluate the time taken by mass to descend with the help of angular acceleration equation and equation of motion | Evaluate | Evaluate |

**2. Instructional Strategy**

### 2.1 Method: Expository

### 2.2 Assessment Method: Formative Assessment

2.3 Description: The animation of rim type flywheel is shown with front and top view for better visualization. The radius of flywheel and mass of metal bob can be varied to visualize the change in time taken for bob to touch the ground in the form of animation. For better understanding one can check their moment of inertia with the simulation.

**3. Task & Assessment Questions**

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| --- | --- | --- | --- |
| **S.No.** | **Instructions given by the Teacher** | **Tasks to be done by the Students** | **Assessment question aligned with the task** |
| 1. | E**x**plain the significance of this experiment in real world applications. | Understand the significance of the experiment and recall its applications. | Q8. Q9 |
| 2. | Explain the complete working of flywheel and how it is useful for physical application | Understand the complete working of the available type of flywheel | Q1, Q6 |
| 3. | Explain how disc flywheel is different from other types of flywheel | Understand the concept of disc type of flywheel and how it is different from other type of flywheel | Q9 |
| 4. | Explain how principal stresses are generated in the rotating disc. | Understand the theory behind generation of stresses | Q2, Q3 |
| 5. | Explain the detail procedure of the experiment | Understand the concept and apply it properly to get the desired result | Q7, Q4 |
| 6. | Explain how to measure angular acceleration | Understand angular acceleration calculation by equating the torque | Q10, Q11 |
| 7. | Explain how to measure time of descend of mass at certain height by using equation of motion | Understand and apply the concept to calculate the time of descend of mass at certain height | Q5, |

**Assessment Questions:**

1. In the case of a flywheel, the maximum fluctuation energy is the
2. ratio of the maximum and minimum energy
3. ratio of the minimum and maximum energy
4. difference between the maximum and minimum energies
5. sum of maximum and minimum energies

Answer: c

1. What is the value of the radius of gyration of disc type flywheel as compared to a rim type flywheel for the same diameter?
2. ½ times
3. 2 times
4. 1/

Answer: d

1. What is the moment of inertia of disc type of flywheel?
2. I= Mr2
3. I=0.5\*Mr2
4. I=2\*Mr2
5. I=0.4\*Mr2

Answer: a

1. Which of the following statements are correct?

Statement A: To absorb energy when demand of energy id less than the supply

Statement B: To give out energy when demand of energy is more than the supply.

1. A is correct and B is wrong
2. B is correct and A is wrong
3. Both A and B are correct
4. Both A and B are wrong

Answer: c

1. what is the value of the radius of gyration of the disc type flywheel as compared to rim type flywheel for the same diameter?

a) 21/2times

b) 1/ (21/2) times

c) 2 times

d) 1/2 times

**Answer:** 1/ (21/2) times

1. The energy is stored in Flywheel in form of
2. Potential energy
3. Kinetic energy
4. Heat energy
5. Electrical energy

**Answer:** Kinetic energy

1. With usual notations for different parameters involved, the maximum fluctuations of energy for a flywheel is given by
2. 2ECS
3. ECS/2
4. 2ECS2
5. 2E2CS

**Answer:** 2ECS

1. Flywheel are generally made from

(A) Cast Iron

(B) High strength steel

(C) Ceramics

(D) All of the above

**Answer:** All of the above

1. Why is the rim type of flywheel is used over the disc type of flywheel?
2. Rim type has less weight compared to disc type of flywheel.
3. Rim type has more weight compared to disc type of flywheel.
4. Disc type of flywheel has more weight than rim type
5. None of the above

**Answer: a**

**10.** The ratio of maximum fluctuation of speed to the mean speed is called

a) Fluctuation of speed

b) Maximum fluctuation of speed

c) Coefficient of fluctuation of speed

d) None of the above

**Answer:** Coefficient of fluctuation of speed

**11.** The difference the maximum and minimum speeds during a cycle is called

a) Fluctuation of speed

b) Maximum fluctuation of speed

c) Coefficient of fluctuation of speed

d) None of the above

**Answer: (b)**

**4. Simulator Interactions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **What students will do?** | **What Simulator will do?** | **Purpose of the task** |
| 1. | See the displayed objectives and apparatus used then click on next button | Display objective and apparatus used | Recall the experiment |
| 2 | Change the values of radius of disc and mass of the bob by scrolling the values available in variable section | Display the value of mass(bob) and radius | To provide basic environment to start the experiment |
| 3 | Calculate the moment of inertia and then click on the “Submit” Button | Display the “Moment of Inertia” Button. | To provide basic environment to start the experiment |
| 4 | Click on the play button | Display the “Control” Button | To start the simulation |
| 5 | Note the value of time | Display time taken to reach the ground | To make student calculate the data |
| 6 | Calculate the time taken by mass(bob) manually | Display observation | To check for the calculated data whether it is correct or not |