



**DEPARTMENT OF MECHANICAL ENGINEERING  
BRANCH : MECHATRONICS**

**17MECC92: DYNAMICS LAB**

**STANDARD OPERATING PROCEDURE**

Name of the Lab/Facility	<b>DYNAMICS LAB</b>
Purpose	A governor, or speed limiter or controller, is a device used to measure and regulate the speed of a machine
Scope	Governor is the device used to control the speed in engines. Governors are used in automobiles
Responsibility	Faculty In-charge and HOD/MECH
<b>STANDARD OPERATING PROCEDURE FOR GOVERNOR</b>	
<ul style="list-style-type: none"> <li>→ Tighten the necessary bolts.</li> <li>→ Start the motor and gradually increase the speed.</li> <li>→ The flyweight will fly outward due to which the sleeve will rise.</li> <li>→ Note down the speed and sleeve rise or calculate by theoretical method.</li> <li>→ Repeat the experiment at different speeds till the balls fly to maximum position.</li> <li>→ Bring back the sleeve down by reducing the speed gradually and stop</li> </ul>	
<b>PRECAUTIONS TO BE FOLLOWED</b>	
<ul style="list-style-type: none"> <li>→ Do not keep the mains on when trial is complete</li> <li>→ Increase the speed gradually.</li> <li>→ Take the sleeve displacement reading when the pointer remain steady</li> <li>→ Measure the height of governor carefully</li> </ul>	
<b>RECORD TO BE MAINTAINED</b>	
<ul style="list-style-type: none"> <li>→ Laboratory Manual containing the experiments that can be performed with the equipments</li> <li>→ Maintain Record</li> </ul>	

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Purpose	A gyroscopic couple is defined as the turning moment in which the changes are opposed by the inclination of the axis of rotation of the gyroscope.
Scope	Gyroscope finds applications in gyrocompass, used in aircraft, naval ship, control system of missiles and space shuttle
Responsibility	Faculty In-charge and HOD/MECH

**STANDARD OPERATING PROCEDURE FOR GYROSCOPIC COUPLE**

- The working principle of the mechanical gyroscope is based on the conservation of angular momentum.
- The mechanical gyroscope is dependent on the ball bearing to spin.
- Start the motor by increasing the voltage with the autotransformer and wait until it attains constant speed  
  
Press the yoke frame No.2 about vertical axis by applying necessary force by hand to the same. {In the clockwise sense seen from above}.
- It will be observed that the rotor frame swings about the horizontal axis yy. Motor side is seen coming upward and the weight pan side going downwards
- Rotate the vertical yoke in the anti clockwise sense seen from above and observe that the rotor frame swings in the opposite sense

**PRECAUTIONS TO BE FOLLOWED**

- When rotating parts of the engine rotate in opposite directions, then negative sign is used.
- The reaction will be vertically downwards on the outer wheels and vertically upwards on the inner wheels.
- The gyroscopic couple will act over the vehicle outwards i.e. in the anticlockwise direction when seen from the front of the vehicle.

**RECORD TO BE MAINTAINED**

- Laboratory Manual containing the experiments that can be performed with the equipments
- Maintain Record

*(Handwritten Signature)*

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Purpose	The purpose of Whirling of shaft is to determine the critical speed or whirling speed of a rotating shaft and it verify the value theoretically
Scope	Whirling of shafts occurs due to rotational imbalance of a shaft, even in the absence of external loads, which causes resonance to occur at certain speeds, known as critical speeds, and also can understand different types of vibrations
Responsibility	Faculty In-charge and HOD/MECH
<b>STANDARD OPERATING PROCEDURE FOR WHIRLING OF SHAFT</b>	
<ul style="list-style-type: none"> <li>→ Fix the shaft properly at both ends</li> <li>→ Check the whole apparatus for tightening the screw etc.</li> <li>→ First increase the voltage slowly for maximum level and then start slowing down step by step</li> <li>→ Observe the loops appearing on the shaft and note down the number of loops and the speed at which they are appearing.</li> <li>→ Slowly bring the shaft to rest and switch of the supply</li> <li>→ Repeat the same procedure for different shaft</li> <li>→ since both the ends have double ball bearing hence both the ends are assumed fixed.</li> </ul>	
<b>PRECAUTIONS TO BE FOLLOWED</b>	
<ul style="list-style-type: none"> <li>→ It is destructive test and fresh test pieces may be used every time</li> <li>→ If the revolution of an unloaded shaft is gradually increased, it will be reached at which violent instability will occur, the shaft.</li> <li>→ Fix the apparatus firmly on suitable foundation</li> </ul>	
<b>RECORD TO BE MAINTAINED</b>	
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**STANDARD OPERATING PROCEDURE**

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Purpose	A compound pendulum has an extended mass, like a swinging bar, and is free to oscillate about a horizontal axis. The compound pendulum depends on the length of gyration, the moment of inertia and the mass of the pendulum as well as gravitational acceleration.
Scope	A compound pendulum has more vibrations and more energy. It can be used Engineering, technical and other construction fields.
Responsibility	Faculty In-charge and HOD/MECH
<b>STANDARD OPERATING PROCEDURE FOR COMPOUND PENDULUM</b>	
<ul style="list-style-type: none"> <li>→ The rod is supported on the knife-edge..</li> <li>→ The total length of suspended rod is noted and 'OG' is determined.</li> <li>→ The bar is allowed to oscillate and the time taken for 10 oscillations is noted</li> <li>→ The time period is calculated.</li> <li>→ The same procedure repeated for the other pendulum.</li> <li>→ Using the experimental time period the radius gyration is calculated using given relation.</li> <li>→ The experimental value is verified with the theoretical value.</li> </ul>	
<b>PRECAUTIONS TO BE FOLLOWED</b>	
<p>The bob of pendulum should be displaced with a small angle.  The amplitude of the oscillation of a simple pendulum should be small.  Fans should be switched off to reduce the air resistance.  The simple pendulum should be oscillate in a vertical plane only.</p>	
<b>RECORD TO BE MAINTAINED</b>	
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Purpose	Tri-filar suspension system is used to find the moment of inertia by three fine vertical wires of equal length.
Scope	Tri-filar suspension system is used for find out the centering correction, Space applications etc.
Responsibility	Faculty In-charge and HOD/MECH
<b>STANDARD OPERATING PROCEDURE FOR TRI-FILAR SUSPENSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>→ Select trifler plates.</li> <li>→ With the help of string of chucks tighten at tops</li> <li>→ Adjust length of string to desire values are measure length as it is</li> <li>→ Give small horizontal twist</li> <li>→ Start stop watch and note down time required for 5 or 10 oscillations</li> <li>→ Repeat experiment by adding weight and changing length</li> </ul>	
<b>PRECAUTIONS TO BE FOLLOWED</b>	
<ul style="list-style-type: none"> <li>→ Use carefully the circular plate</li> <li>→ Set the distance of threads equally</li> </ul>	
<b>RECORD TO BE MAINTAINED</b>	
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