Chapter:3
(Indicating Instruments)

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Types of Torques:-

In order to ensure proper operation of indicating instruments, the following three torques are required:

- Deflecting torque.
- Controlling torque.
- Damping torque.

- Deflecting torque:

The deflecting force is the force required for moving the pointer from rest on the calibrated scale. The current (or voltage) under measurement is utilized to produce the deflecting force.

- Controlling torque:

The device used for controlling the deflection of the pointer in measuring instruments over the scale is called the control device. The torque which controls the movements of the pointer is called the control torque.

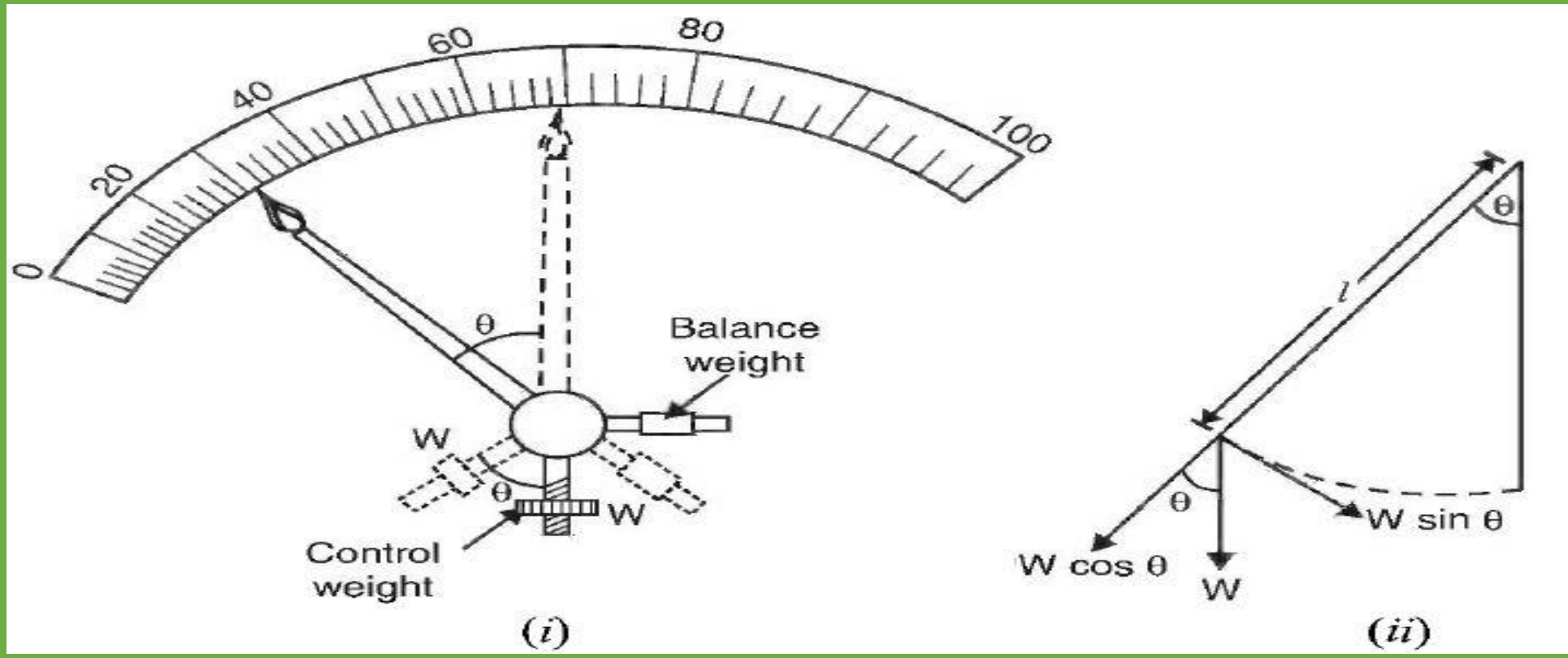
- Damping torque:

A damping torque is produced by a damping or stopping force which acts on the moving system only when it is moving and always opposes its motion. Such a torque is necessary to bring the pointer to rest quickly.

Spring and gravity control system:

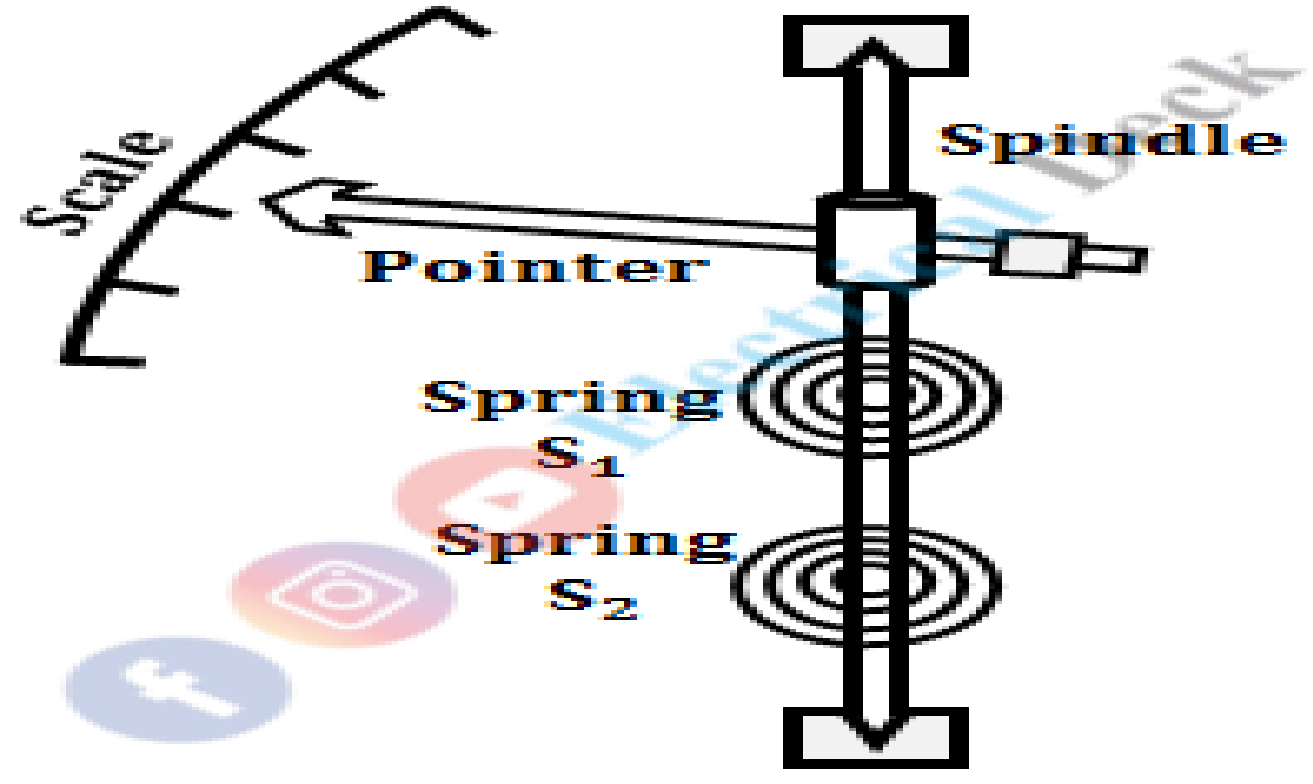
- **Spring control system:**

This is the most common method of providing controlling torque in electrical instruments. A spiral hairspring made of some non-magnetic material like phosphor bronze is attached to the moving system of the instrument .



- **Gravity control system:**

In this method, a small adjustable weight W is attached to the moving system which provides the necessary controlling torque. In the zero position of the pointer, the control weight hangs vertically downward and therefore provides no controlling torque.



- **Damping torque:**

Damping torque is a physical process of controlling a system's movement through producing motion that opposes the natural oscillation of a system. Similar to friction, it only acts when a system is in motion, and is not present if the system is at rest.