CHAPTER THREE
Equilibrium of a Particle

Introduction

* The equilibrium (equilibrium) of a particle (particle) is defined as:

- If the particle is in static equilibrium (static equilibrium), then the net force on the particle is zero.

- If the particle is in dynamic equilibrium (dynamic equilibrium), then the net force on the particle is zero.

Free Body Diagram

- Draw the free body diagram (FBD) of the particle (particle) showing all forces acting on it.

- Find the net force (net force) on the particle.

- Use the equations of equilibrium (equilibrium) to solve for unknown forces (forces).

Example:

- A spring (spring) is attached to a wall.

\[ F = k \Delta \]
b) Cables and Pulleys:

The diagram shows a pulley system with a cable attached to a weight. The pulley is used to lift the weight. The forces involved in this system are typically analyzed using the free-body diagram (FBD). The forces include the weight of the object and the tension in the cable.

1. The weight experiences gravitational force (Fg).
2. The cable applies a tension force (T) to lift the weight.
3. The pulley exerts a frictional force (f) along the cable path.
4. The forces acting on the pulley include the tension force (T) and the frictional force (f).

The free-body diagram (FBD) shows the forces acting on the pulley and the weight. The forces are typically analyzed using vector components and Newton's second law (F=ma).
Ex: The sphere shown in figure has a mass of (6 kg) and is supported as shown. Draw a FBD of:

a) The sphere
b) The cord CE
c) The knote at C

\[ F_{CE} \]

\[ F_{EC} \]

\[ F_{CE} \]

\[ F_{CB} \]

\[ F_{CD} \]

\[ F_{CE} \]