AL MUSTAQBAL UNIVERSITY

ENGINEERING TECHNICAL COLLEGE

DEPARTMENT OF BUILDING & CONSTRUCTION ENGINEERING TECHNOLOGIES

ENGINEERING PHYSICS

FIRST CLASS

LECTURE NO. 8

ASST. LECTURER

Fatima Muslim

Rotational Motion

Rotational motion exists everywhere in the universe. The motion of electrons about an atom and the motion of the moon about the earth are examples of rotational motion.

Objects cannot be treated as particles when exhibiting rotational motion since different parts of the object move with different velocities and accelerations. Therefore, it is necessary to treat the object as a system of particle.

The Plane Motion of a Rigid Body

When all parts of a rigid body move parallel to a fixed plane, then the motion of the object is referred to as plane motion.

There are two types of plane motion, which are given as follows:

1. The pure rotational motion: The rigid body in such a motion rotates about a fixed axis that is perpendicular to a fixed plane. In other words, the axis is fixed and does not move or change its direction relative to an inertial frame of reference.

2. The general plane motion: The motion here can be considered as a combination of pure translational motion parallel to a fixed plane in addition to a pure rotational motion about an axis that is perpendicular to that plane.

Example1/Convert each of the following into the other angular units: 15◦, 0.25 rev/s2, 3 rad/s.

Solution:

$$15° = (\ 15\ \text{deg})\left(\frac{1\ rev}{360\ deg}\right) = 0.042\ rev$$

$$15° = (15\ \text{deg})\left(\frac{2\pi}{360 deg}\right) = 0.26\ rad$$

$$0.25\frac{rev}{s^2} = \left(0.25\frac{rev}{s^2}\right)\left(\frac{2\pi\ rad}{1\ rev}\right) = 1.57\ rad/s^2$$

$$0.25\frac{rev}{s^2} = \left(0.25\frac{rev}{s^2}\right)\left(\frac{360\ deg}{1\ rev}\right) = 90\ deg/s^2$$

$$3\frac{rad}{s} = \left(3\frac{rad}{s}\right)\left(\frac{1\ rev}{2\pi\ rad}\right) = 0.48\ rev/s$$

$$3\frac{rad}{s} = \left(3\frac{rad}{s}\right)\left(\frac{360\ deg}{2\pi\ rad}\right) = 172\ deg/s$$