Q:-Define the following:-Vibratory or Oscillatory motion

To and fro motion of a body about a mean

position is called oscillatory motion. For example motion of pendulum

Restoring Force

The force which bring a system back to its stable equilibrium position is called restoring force.

Mathematically F=-kxNebative sign show that restoring force acts o, posite to displacement from mean position.

Heck's Law

According to Hook's law, within the elastic limit the applied force is directly proportional to displacement from mean position.

$$F \propto x$$

 $F = kx$

Here K is proportionality constant called spring constant.

Spring Constant

Harmonic Motion.

Force per unit length of a spring is called epring constant.

$$K = \frac{F}{x}$$

Unit of spring constant is Nm⁻¹.

Simple Harmonic Motion

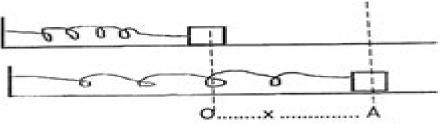
The oscillatory motion in which acceleration of the body at any instant is directly proportional to displacement from mean position and is always directed toward mean position is called Simple

$$a \propto -x$$

For example motion of pendulum

Q:- Show that motion of mass spring system is SHM.

Consider a mass attached to one end of a spring. Mass can move freely on a frictionless surface as shown in figure



If an external force Fest displaces the body from position O to A through displacement x then By Hook's Law

$$\overline{F_x} = k\vec{x}$$

orce F is equal a

The restoring Force F is equal and opposite to external force Fext so

$$\vec{F} = -k\vec{x} \dots (1)$$

When it released from A , it vibrates about O.

According to Newton's 2nd Law of motion

$$\vec{F} = m\vec{a} \dots \dots (2)$$

Equating (1) and (2)

$$m\vec{a} = -k\vec{x}$$
$$\vec{a} = -\frac{k}{m}\vec{x}$$

$$\frac{k}{m} = constant$$

$$\vec{a} = -Constant \vec{x}$$

 $\vec{a} \propto -\vec{x}$

Hence motion of mass spring system is SHM.

Q:- Define the following Wave form of SHM

The curve representing the variation of

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D Kirk

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