THEORY OF MACHINE AND MECHANISM II

TUTORIAL NO: 10

CONTINUOUS SYSTEM

1. A uniform string of length *l* and a large initial tension T, stretched between two supports, is displaced laterally through a distance a_0 at the center, and is released at t = 0. Find the equation of motion for the string.

2. Determine the normal functions for free longitudinal vibration of a bar of length *l* and uniform cross section. One end of the bar is fixed and the other free.

3. A bar is fixed at one end and is pulled at the other end with a force P. The force is suddenly released. Investigate the vibration of the bar.

4. Find the frequency equation of a uniform beam fixed at one end and free at the other for transverse vibrations.

5. A uniform beam fixed at one end and simply supported at the other is having transverse vibrations. Derive suitable expression for equation.

ANSWERS

1. $y(x,t) = \sum_{n=1,3,5,\ldots}^{\infty} \frac{8a_0}{n^2\pi^2}(-1)^{\frac{n-1}{2}} \sin\frac{n\pi x}{l}\cos\frac{n\pi c}{l}t$

2. $u(x,t) = \sum_{n=1,3,5,\ldots.}^{\infty} \sin\frac{n\pi x}{2l}\left(C\sin\omega t + D\cos\omega t\right)$

3. $u(x,t) = \frac{8\varepsilon l}{\pi^2}\sum_{n=1,3,5,..}^{\infty}(-1)^{\frac{n-1}{2}}\sin\frac{n\pi x}{2l}\cos\frac{n\pi c}{2l}t$

4. $\cosh\beta l\cos\beta l + 1 = 0$

5. $\tan\beta l = \tanh\beta l$