Deptt of Applied Mechanics

30-11-06

Dynamics and Advanced Dynamics
(AML 433 and AML 434)

MM: 150

Major Examination

1. Uncouple the given set of equations of motion

a) $[M]\{\ddot{w}\} + [C]\{\dot{w}\} + [K]\{w\} = \{P(t)\}$

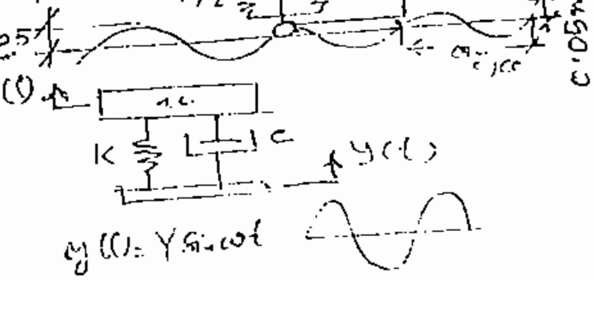
and obtain "n" independent SDOF eqns

b) How are these independent eqns solved to obtain the final response of the dynamic system?

2. A nuclear reactor is required to be isolated from the ground excitations. Develop the design spectrum for displacement for an arbitrary ground excitation record. Outline the general method to obtain the response of a multidegree freedom system using response spectrum.

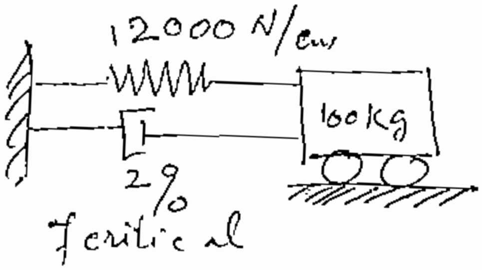
3. Derive the equation of motion for the transverse vibration of a beam with distributed properties neglecting the shear deformation and rotary inertia effects. Solve the above diff. eqn for uniform beam with simple supports for the free vibration characteristics.

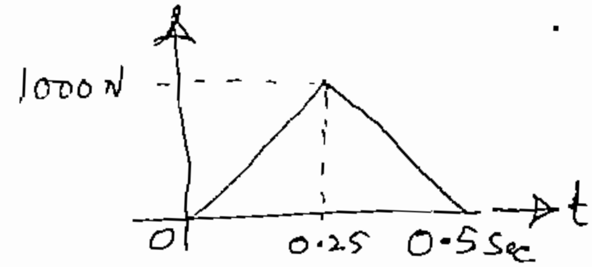
4. A motor vehicle while moving on a rough road vibrates in the vertical direction. Vehicle mass is 1200 kg & suspension system has an equivalent spring const of 400 kN/m



…ing the damping ratio of $\xi = 0.5$ consider the …icle speed as 20 Km/hr. Determine the displacement …plitude of the vehicle. The road is modelled … of sinusoidal roughness with an amplitude of 0.05m …d a wave length of 6m.

Determine the steady state response for the given SDOF due to a transient load of triangular nature





The lowest freq. & mode shape are given for a dynamic system. using sweeping algorithm of power method find out the second mode shape & frequency by making only one iteration

If a random forcing function is ergodic and stationary how it will facilitate the dynamic response calculation.

6(a) $[A]^{-1} = \begin{bmatrix} 0.1 & 0.1 & 0.1 \\ 0.1 & 0.2 & 0.2 \\ 0.1 & 0.3 & 0.3 \end{bmatrix}$ $\lambda_1 = 1.98$ $\phi_1 = \begin{Bmatrix} 1.0 \\ 1.8 \\ 2.24 \end{Bmatrix}$