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Section B

Semister 06

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Assignment NO 1

Applications of PDE.

(i) Elliptic

Steady heat transfer, flow and diffusion

(ii) Parabollic

Transient heat transfer, flow and diffusion

$$d\frac{\partial u}{\partial t} - \nabla(c\nabla u) + au = f.$$

(iii) Hyperbollic

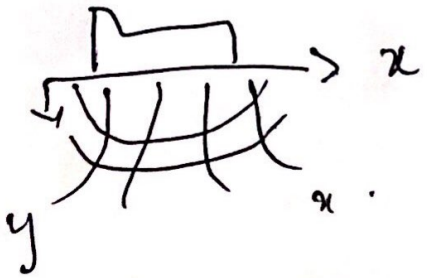
Transient wave equation.

$$d\frac{\partial^2 u}{\partial t^2} - \nabla\cdot(c\nabla u) + au = f.$$

(iv) Elastic foundation.

$$\frac{\partial w}{\partial x^{4}} + 2\frac{\partial^{4}}{\partial x^{2} dy} + \frac{\partial^{4} w}{\partial y^{4}} = \frac{F_2}{D} - \frac{k}{D} w.$$

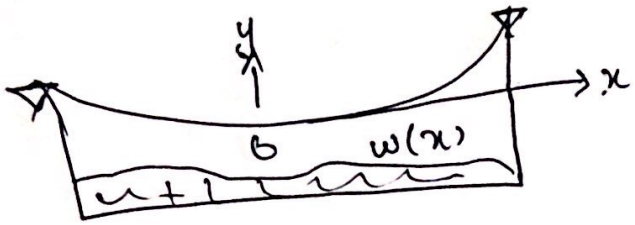
(v) Fluid flow under beam



$$kx \frac{\partial h}{\partial x^{2}} + ky \frac{\partial h}{\partial y^{2}} = 0.$$

Applications of ODE

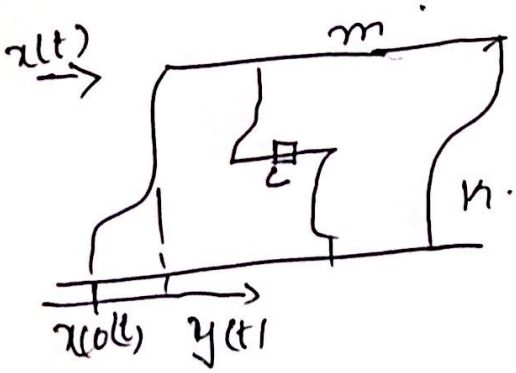
(i) Suspension bridge



$$\frac{d^2y}{dx^2} = \frac{w(x}{H}$$

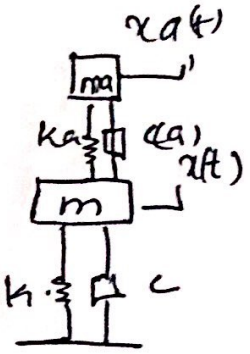
H is tension
0 = lowest point

(ii) vibration of single story shear building under excitation of earthquake.



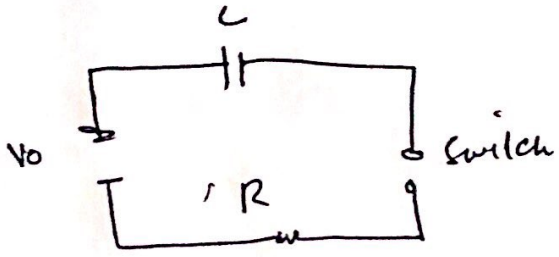
$$my(t) + cy(t) + ky(t) = -mx_0(t).$$

(3) The equation of motion governing the vibration of equipment and the observer are given by



(4) $m\ddot{x} + (c+c_a)\dot{x} + (k+k_a)x - c_a\dot{x}_a - k_a x_a = F_0 \sin \Omega t$;

$m_a\ddot{x}_a + c_a\dot{x}_a + k_a x_a - c_a\dot{x} - k_a x = 0$.



Kirchoff law.

$$\frac{di(t)}{dt} + Ri(t) = V = \frac{dI(t)}{dt} + \frac{R}{L}i(t) = \frac{V}{L}$$

(5) can be used in fluid dynamics design of container and funnel

(6) Applicable in rigid body dynamics