**Home work Assaignment No.4**
**Due date 10.05.2008**

**Q.No.1**. Solve the Caucy Euler Equations, for $x > 0$

$$(i)\ x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 4y = x^2 + 16(\ln x)^2$$

$$(ii)\ x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 3y = x^2 - 4x + 2$$

**Q.No.2**. Use transformation $x + 3 = e^t$ to solve

$$(x+3)^2\frac{d^2y}{dx^2} + (x+3)\frac{dy}{dx} - 2y = 2x^2$$

**Q.No.3.** Use transformation $t = \sin x$ to solve

$$\frac{d^2y}{dx^2} + (\tan x)\frac{dy}{dx} + (\cos^2)y = 0$$

**Q.No.4.** Solve the initial value problem

$$x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 0.\ y(1) = 2,\ \frac{dy}{dx}(1) = 8.$$

**Q.No.5.** A load P is applied to each end of a column of length L and is also subject to a force ,$F$, at $x = \frac{L}{2}$. The differential equation is given by

$$EI\frac{d^2y}{dx^2} + Py + \frac{F}{2}x = 0, \quad 0 \leq x \leq \frac{L}{2},$$

wher y is the deflection at a distance $x$. If at $x = 0, y = 0$, and $x = \frac{L}{2}, \frac{dy}{dx} = 0$,then show that

$$y = \frac{F}{2kP}\left[\sin(kx)\sec(\frac{kL}{2}) - kx\right], \text{where } k = \sqrt{\frac{P}{EI}}$$

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**Q.No.6**. Solve the system of differential equations by using elimination method

$$(i)\begin{cases} \frac{dx}{dt} = -y + t \\ \frac{dy}{dt} = x - t \end{cases}$$

$$(ii)\begin{cases} (D+1)x + (D-1)y = 2 \\ 3x + (D+2)y = -1 \end{cases}$$