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ENV381

1)  $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = \cos t$

\* Assuming  $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 0$

$M^2 + 5M + 6 = 0$

$M^2 + 3M + 2M + 6 = 0$

$M(M+3) + 2(M+3) = 0$

$(M+3)(M+2) = 0$

$M = -2, M = -3$

$y = Ae^{-2t} + Be^{-3t}$

$x = Ae^{-2t} + Be^{-3t}$

$F(x) = \cos t$

P.T.  $y = \cos t + D \cos t$

$\frac{d^2x}{dt^2} = -\cos t + D \cos t$

$\frac{d^2x}{dt^2} = -\cos t - D \cos t$

$(-10t - D \cos t) + 5(-\cos t + D \cos t) + 6(\cos t + D \cos t) = \cos t$   
 $(-10t - D \cos t) - 5 \cos t + 5D \cos t + 6 \cos t + 6D \cos t = \cos t$   
 $-10t + (-D - 5 + 5D + 6 + 6D) \cos t = \cos t$   
 $-10t + (5D + 1) \cos t = \cos t$

$5D + 1 = 1 \times 6$

$-10t + 6 = 0 \times 5$

$8D + 8 = 6$

$-20t + 30 = 0$

$$C_{00} = 1$$
$$D = 1/10$$

Substitute C in equ 1

$$5C_{00} + 5D = 1$$

$$5 + 5D = 1$$

$$5D = -4$$

$$D = -4/5$$

$$y = C_{00}$$

$$x = C_{00} + D e^{-2t}$$

$$y = 1/10 e^{-2t} + 1/10$$

$$G.D. = C.F. + P.I.$$

$$x(t) = A e^{-2t} + B e^{-3t} + 1/10 C_{00} + 1/10 D e^{-2t}$$

$$0.1 = A e^0 + B e^0 + 1/10 C_{00} + 1/10 D e^0$$

$$0.1 = A + B + 1/10$$

$$0.1 - 1/10 = A + B$$

$$A + B = 0$$

$$\frac{dx}{dt} = -2A e^{-2t} - 3B e^{-3t} - 1/10 D e^{-2t} + 1/10 C_{00}$$

$$0 = -2A - 3B + 1/10$$

$$-2A - 3B = -0.1 \times 1$$

$$-A + B = 0$$

$$2A + 3B = 0.1 \times 1$$

$$A + B = 0 \times 2$$

$$2A + 3B = 0.1$$

$$2A + 2B = 0$$

$$B = 0.1 = 1/10$$

Substitute B in equ 11

$$A + 0.1 = 0$$

$$A = -0.1$$

$$X = -N_0 e^{-2t} + N_0 e^{-3t} + N_0 \cos t + N_0 \sin t$$

