Name → Ebis Blessing Okokpa

Matric NO: 15/ENG07/013.

Dept: Petroleum Engineering.

Assignment 2.

1) $\frac{d^2y}{d\theta^2} + 4\frac{dy}{d\theta} + 5y = 6\sin\theta$

$y'' + 4y' + 5y = 6\sin\theta$

$k^2 + 4k + 5 = 0$

$k^2 + 4k = -5$

$k^2 + 4k + 2^2 = -5 + 2^2$

$(k^2 + 2)^2 = -1$

$(k + 2) = \pm\sqrt{-1}$

$k + 2 = \pm i$

$k = \pm i - 2.$

$k_1 = +i - 2$

$k_2 = -i - 2$

$y_i = Ce^{(-2+i)\theta} + C_2e^{(-2-i)\theta}$

$y_{ii} = C_1e^{-2\theta+i\theta} + C_2e^{-2\theta-i\theta}$

$y_{ii} = C_1e^{-2\theta}\cdot e^{i\theta} + C_2e^{-2\theta}\cdot e^{-i\theta}$

$y_{ii} = e^{-2\theta}[Ce^{i\theta} + C_2e^{-i\theta}]$

$y_{ii} = e^{-2\theta}[Ae^{i\theta} + Be^{-i\theta}]$

$y_{iii} = e^{-2\theta}[A\cos\theta + B\sin\theta]$

$y_p = A\cos\theta + B\sin\theta$

$y_p' = -A\sin\theta + B\cos\theta$

$y_p'' = -A\cos\theta - B\sin\theta$

$y'' + 4y' + 5y = 6\sin\theta$

$-A\cos\theta - B\sin\theta + 4(-A\sin\theta + B\cos\theta) + 5(A\cos\theta + B\sin\theta) = 6\sin\theta$

$-A\cos\theta - B\sin\theta - 4A\sin\theta + 4B\cos\theta + 5A\cos\theta + 5B\sin\theta = 6\sin\theta$

$(-A\cos\theta + 4B\cos\theta + 5A\cos\theta) + (-B\sin\theta - 4A\sin\theta + 5B\sin\theta) = 6\sin\theta$

$(-A + 4B + 5A)\cos\theta + (-B - 4A + 5B)\sin\theta = 6\sin\theta$

$4A + 4B = 0$

$-4A + 4B = 6$

$8B = 6$

$B = \frac{6}{8} = \frac{3}{4}$.

Recall that $4A + 4B = 0$

$4A + 4(\frac{3}{4}) = 0$

$4A + 3 = 0$

$A = \frac{-3}{4}$.

$\therefore y_p = \frac{-3}{4}\cos\theta + \frac{3}{4}\sin\theta$

$y = y_a + y_p$

$y = e^{-2\theta}[A\cos\theta + B\sin\theta] + \frac{3}{4}\sin\theta - \frac{3}{4}\cos\theta$

ii) Steady state equation.

$y_p' = 0$

$y_p' = \frac{3}{4}\cos\theta + \frac{3}{4}\sin\theta = 0$

$\therefore \frac{3}{4}\cos\theta + \frac{3}{4}\sin\theta = 0$

$\frac{3}{4}\cos\theta = -\frac{3}{4}\sin\theta$

$\frac{\cos\theta}{\cos\theta} = -\frac{\sin\theta}{\cos\theta}$

$1 = -\tan\theta$

$\tan\theta = -1.$

Question 2.

$$EI\frac{d^2y}{dx^2} = \frac{w}{2}(L-x)^2$$

$$EIm^2 = 0$$

$$m^2 = 0$$

$$\sqrt{m^2} = \pm\sqrt{0}$$

$$m = \pm 0.$$

$$y = e^{0\cdot x}[A + Bx]$$

$$y = A + Bx$$

$$y_p = y =$$