

H.W. 8 Solution

Q1)

$$y = 7e^{3x} + 2x$$

$$\xrightarrow{CH-EQ} f(m) = (m - 3)m^2 = 0$$

$$\text{i.e. } m^3 - 3m^2 = 0$$

$$\implies \text{DE: } y^{(3)} - 3y^{(2)} = 0$$

Q2)

$$y = 6 + 3xe^x - \cos x$$

$$\xrightarrow{CH-EQ} f(m) = m(m - 1)^2[(m - i)(m + i)] = 0$$

$$\implies m(m - 1)^2(m^2 + 1) = 0$$

$$\implies m[m^2 - 2m + 1][m^2 + 1] = 0$$

$$\implies m[m^4 - 2m^3 + m^2 + m^2 - 2m + 1] = 0$$

$$\implies m[m^4 - 2m^3 + 2m^2 - 2m + 1] = 0$$

$$\implies m^5 - 2m^4 + 2m^3 - 2m^2 + m = 0$$

$$\implies \text{DE: } y^{(5)} - 2y^{(4)} + 2y^{(3)} - 2y^{(2)} + y^{(1)} = 0$$

Q3)

$$y = 4xe^x \sin(2x)$$

$$\xrightarrow{CH-EQ} f(m) = \{[m - (1 + 2i)][m - (1 - 2i)]\}^2 = 0$$

$$\implies \{[(m - 1) - 2i][(m - 1) + 2i]\}^2 = 0$$

$$\implies [(m - 1)^2 + 4]^2 = 0$$

$$\implies [m^2 - 2m + 5]^2 = 0$$

$$\implies m^4 - 2m^3 + 5m^2 - 2m^3 + 4m^2 - 10m + 5m^2 - 10m + 25 = 0$$

$$\implies m^4 - 4m^3 + 14m^2 - 20m + 25 = 0$$

$$\implies \text{DE: } y^{(4)} - 4y^{(3)} + 14y^{(2)} - 20y^{(1)} + 25y = 0$$

Q4)

$$y = \cos^2 x = \frac{1 + \cos 2x}{2} = \frac{1}{2} + \frac{1}{2} \cos 2x$$

$$\xRightarrow{\text{CH-EQ}} f(m) = m[m - 2i][m + 2i] = 0$$

$$\implies m(m^2 + 4) = 0$$

$$\implies m^3 + 4m = 0$$

$$\implies \text{DE: } y^{(3)} + 4y^{(1)} = 0$$