The A.E. of this DE is

$$3r^2 + 8r + 4 = 0$$
$$(3r+2)(r+2) = 0$$
$$r = -2, -2/3$$

So $I_{2,h} = c_1 e^{-2t} + c_2 e^{-2/3 t}$

$r=0$ is not a root of the A.E. so a particular soln has the form $I_{2,p} = A$, $4A = 2$, $A = 1/2$.

So

$$I_2 = 1/2 + c_1 e^{-2t} + c_2 e^{-2/3 t}$$
$$I_2(0) = 1/2 + c_1 + c_2 = 0$$
$$\dot{I}_2 = -2c_1 e^{-2t} - 2/3\, c_2 e^{-2t/3}$$
$$\dot{I}_2(0) = -2c_1 - 2/3\, c_2 = 0$$
$$c_1 + c_2 = -\tfrac{1}{2}$$
$$-2c_1 - 2/3\, c_2 = 0$$
$$2c_1 + 2c_2 = -1$$
$$4/3\, c_2 = -1$$
$$c_2 = -3/4$$
$$c_1 = 1/4$$

and

$$\boxed{\begin{aligned} I_2 &= 1/2 + 1/4\, e^{-2t} - 3/4\, e^{-\frac{2}{3}t}. \\ I_3 &= 4I_2 + 3\dot{I}_2 \\ &= 2 - \tfrac{1}{2} e^{-2t} - 3/2\, e^{-2/3 t} \\ I_1 &= I_2 + I_3 \\ &= 5/2 - 1/4\, e^{-2t} - 9/4\, e^{-2/3 t} \end{aligned}}$$