On the water side (in the tubes) $Re = \frac{4\dot{m}}{\pi \mu D}$

$$\therefore Re = \frac{4 \times 12/60 \times 1/10}{\pi \ 0.651 \times 10^{-3} \times 0.006} = 6519$$

(properties at 40°C used) $Pr = 4.31$

Using $Nu = 0.023 \ Re^{0.8} \ Pr^{0.4} = 0.023 \ 6519^{0.8} \ 4.31^{0.4} = 46.4$

$$\therefore h = \frac{\lambda Nu}{d} = \frac{0.632 \times 46.4}{0.006} = \underline{4890 \ W/m^2K}$$

Using $\frac{1}{U} = \frac{1}{h_1} + \frac{1}{h_2} = \frac{1}{1100} + \frac{1}{4890}$ $\therefore \underline{U = 941 \ W/m^2K}$

$$(\dot{m}C_p)_{water} = \frac{12}{60} \times 4.185 \times 10^3 = 837 \ W/K$$

$$(\dot{m}C_p)_{air} = \frac{30}{60} \times 1.01 \times 10^3 = 505 \ W/K$$

$$\therefore C = \frac{505}{837} = \underline{0.603}$$

$$\therefore NTU = \frac{941 \times \pi \times 0.006 \times 1.2 \times 10}{505} = \underline{0.422}$$

$$E = \frac{1 - e^{-NTU(1-C)}}{1 - C\,e^{-NTU(1-C)}} = \frac{1 - e^{-0.422(1-0.603)}}{1 - 0.603\,e^{-0.422(1-0.603)}}$$

$$= \underline{\underline{0.315}}$$

$$\therefore \frac{\Delta T_{air}}{\Delta T_{max}} = 0.315 \quad \therefore \Delta T_{air} = 0.315(300-12) = 90.7K$$

$$\Delta T_{water} = C \, \Delta T_{air} = 0.603 \times 90.7 = 54.7K$$

$$\therefore T_{c2} = 12 + 54.7 = \underline{\underline{66.7°C}} \quad \text{i.e. } < 85°C$$

A HX with more surface area (or fins) is required.