1.(a) Write KCL at V^- assuming all currents are leaving,

So $i_{R_1} = -i_{C_1}$

So $i_{C_1} = C_1 \frac{d(0 - V_1(t))}{dt}$

So, $-\frac{V_o - 0}{R_1} = C_1 \frac{dV_1(t)}{dt} \Leftrightarrow \int -\frac{V_o}{R_1 C_1} dt = \int dV_1(t)$

Thus, $\boxed{V_1(t) = -\frac{1}{R_1 C_1} \int_0^t V_o \, d\tau}$

(e). $V_{TH} = \frac{R_4}{R_4 + R_5} V_{SAT}$, since $\pm V_{TH} = \pm 5V$, $V_{sat} = 10V$, $R_4 = 10k\Omega$

So $\boxed{R_5 = 10k\Omega}$

Now, $T_1 = R_1 C_1 \frac{2 V_{TH}}{V_{SAT}}$ and $T_1 + T_2 = \frac{1}{1kHz} = 1ms$, $T_1 = T_2$

$\Rightarrow T_1 = 0.5ms$

So $0.5ms = R_1 \cdot 0.01mF \cdot \frac{2.5V}{10V} \Rightarrow \boxed{R_1 = 50\Omega}$