Nonlinear Dynamics in Electric Circuits (10 points)

Part A. Stationary states and instabilities (3 points)

A.1 (0.4 pt)

$R_{\text{on}} =$

$R_{\text{off}} =$

$I_0 =$

$R_{\text{int}} =$

A.2 (1 pt)

Possible number of stationary states for $R = 3.00\ \Omega$:

Possible number of stationary states for $R = 1.00\ \Omega$:

A.3 (0.6 pt)

$I_{\text{stationary}} =$

$V_{\text{stationary}} =$

A.4 (1 pt)

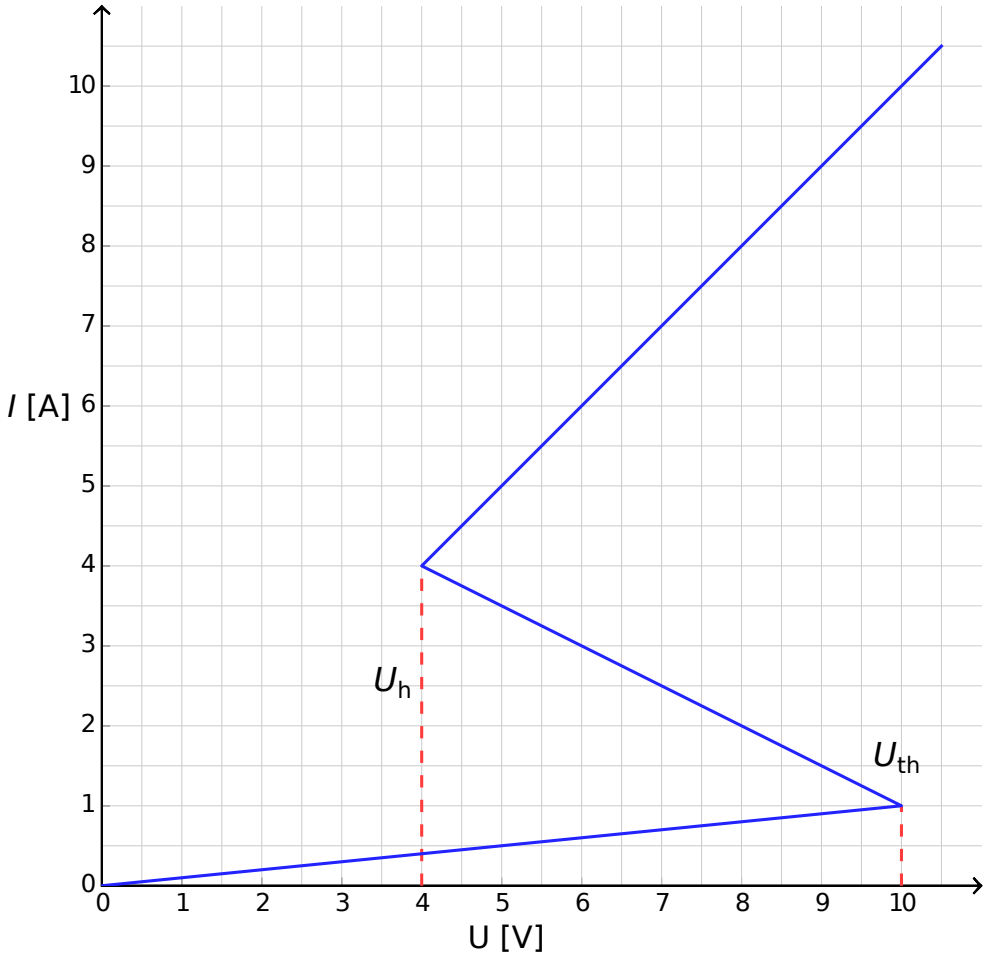
Behaviour for $I(t=0) > I_{\text{stationary}}$:

Behaviour for $I(t=0) < I_{\text{stationary}}$:

Is the stationary state: ☐ stable? ☐ unstable?

Part B. Bistable non-linear elements in physics: radio transmitter (5 points)

B.1 (1.8 pt)



Justification:

B.2 (1.9 pt)

Formula of $t_1 =$

Numerical value of $t_1 =$

Formula of $t_2 =$

Numerical value of $t_2 =$

Numerical value of $T =$

B.3 (0.7 pt)

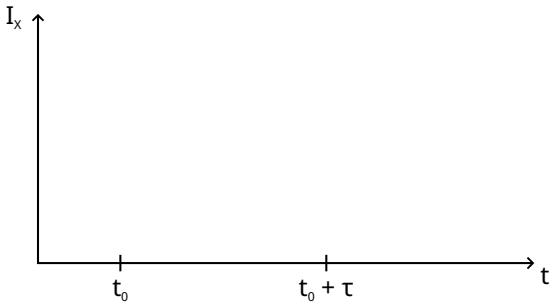
$P \approx$

B.4 (0.6 pt)

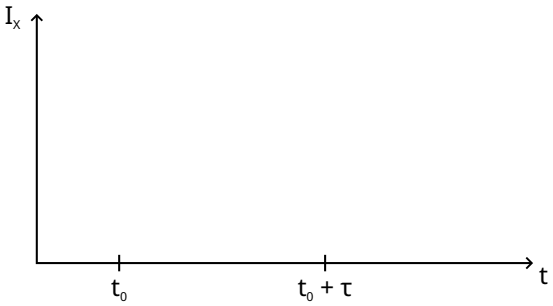
$s =$

Part C. Bistable non-linear elements in biology: neuristor (2 points)

C.1 (1.2 pt)
Sketch for $\tau < \tau_{\text{crit}}$:



Sketch for $\tau > \tau_{\text{crit}}$:



C.2 (0.6 pt)

Formula of $\tau_{\text{crit}} =$

Numerical value of $\tau_{\text{crit}} =$

C.3 (0.2 pt)

Is the circuit a neuristor? ☐ Yes ☐ No