

Question 1

Consider the series RC circuit shown in Fig. 1.

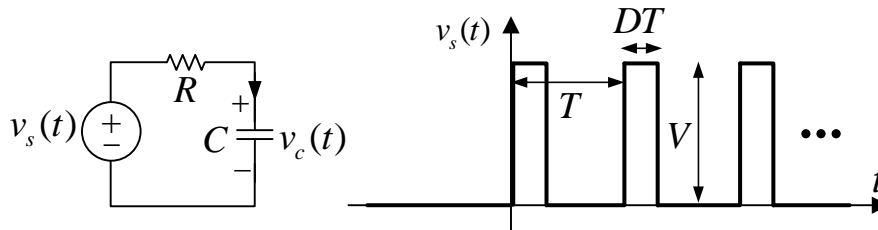


Figure 1: A series RC circuit.

(a) Express the signal $v_s(t)$ in terms of elementary signals. Note that D denotes the duty cycle and $v_s(t) = 0$ for $t < 0$.

(b) Find the zero-state response of the capacitor voltage $v_c(t)$ for all time.

(c) Find the complete response of the capacitor voltage for $t > 0$ if the capacitor initial voltage is $v_c(0^-) = V_0$.

Question 2

Find an expression for $v_c(t)$ in Fig. 1 valid for $t > 0$. Further, calculate the steady state voltage of the capacitor.

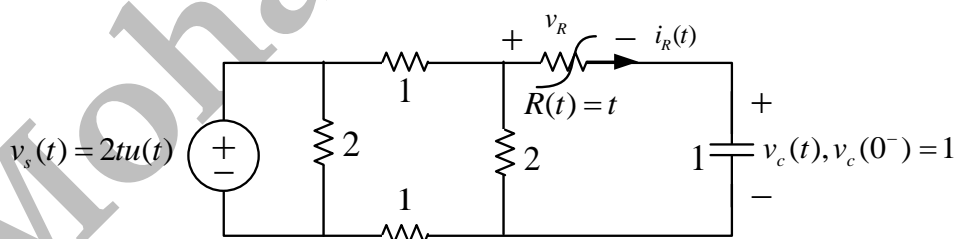


Figure 2: A first-order circuit.

Question 3

Find the differential equation governing the response $v_3(t)$ in the circuit below if the initial conditions are $i_L(0^-)$, $v_1(0^-)$, $v_2(0^-)$, and $v_3(0^-)$.

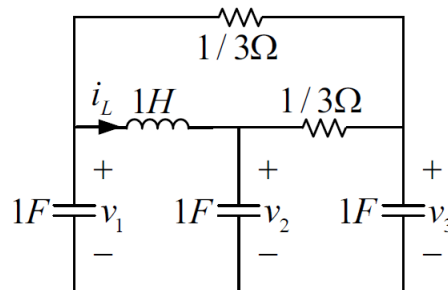


Figure 3: An LTI circuit.

Question 4

Calculate the current through the $2\ \Omega$ resistor in Fig. 4.

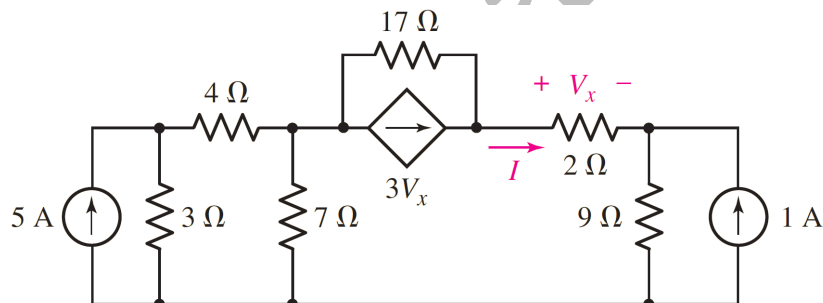


Figure 4: A resistive circuit.