Indian Institute of Technology Patna
Department of Electrical Engineering
EE101 - Electrical Sciences
Autumn - 2016
Mid Sem Exam
21 September 2016

There are 5 problems. They carry equal marks.

$$(5 \times 6 = 30)$$

## 1. Consider the network.

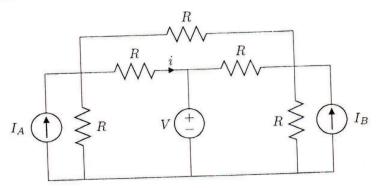


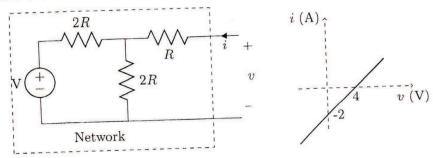
Figure 1

The current i can be written as

$$i = AV + BI_A + CI_B$$

Find the constants A, B and C.

2. Consider the network and its terminal characteristics.



- (a) Find the V and R of the Network.
- (b) Draw the Thevenin and Norton equivalent of the network.
- (c) Find v and i in the network shown here.

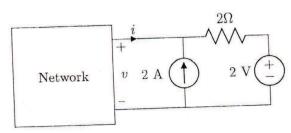
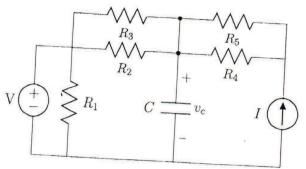


Figure 2

3. Consider the network.



Find  $v_C(\infty)$  and  $\tau$ .

4. Find  $v_c(t)$  and  $i_L(t)$  and plot them for t > 0. Inductor and capacitor do not have any initial charge.

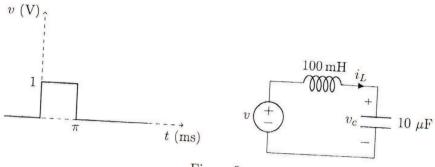
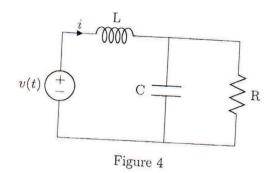


Figure 3

5. Consider the circuit.



- (a) Assume the circuit is in sinusoidal steady state with  $v(t) = V_m \cos(\omega t)$ . Let i(t) be  $I_m \cos(\omega t + \phi)$ . Find  $I_m$  and  $\phi$ .
- (b) For a given R, C, and  $\omega,$  find L such that i is in phase with v .