Linear Circuit Theory

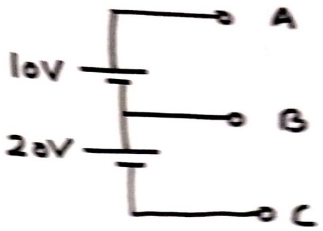
L03: Concepts of dependent source

- Solution of Question of last lecture
- Concepts of dependent source
- Questions based on nodal analysis

Calculate value of
(a) VA , VB, VC ??

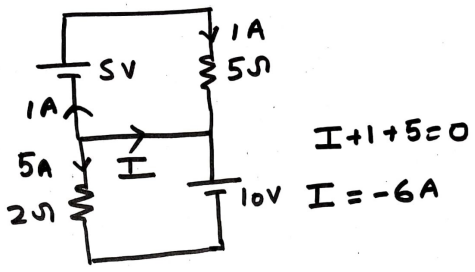
(b) VAB , VBC , VCA

- VAB= VA-VB=10V ,
- VBC= VB-VC =20V,
- VCA=VC –VA =-30



(a)

(b) Calculate Current

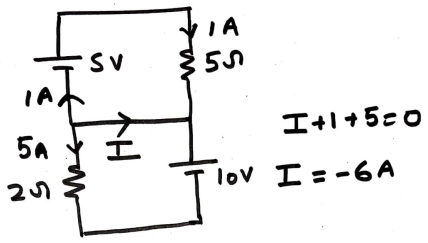


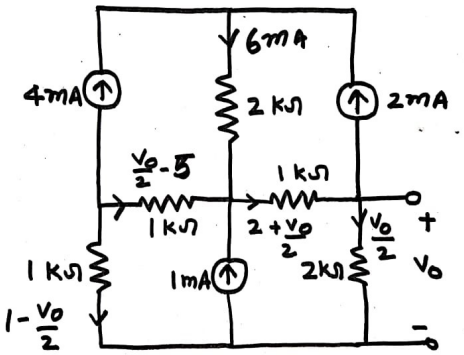
(C) Calculate V_0

$$\left(\frac{V_0}{2}-5\right)\times 1 + \left(2+\frac{V_0}{2}\right)1 + V_0 - \left(1-\frac{V_0}{2}\right) = 0$$

$$V_0 = \frac{8}{5}.V$$

(d) Calculate Voltage across current source



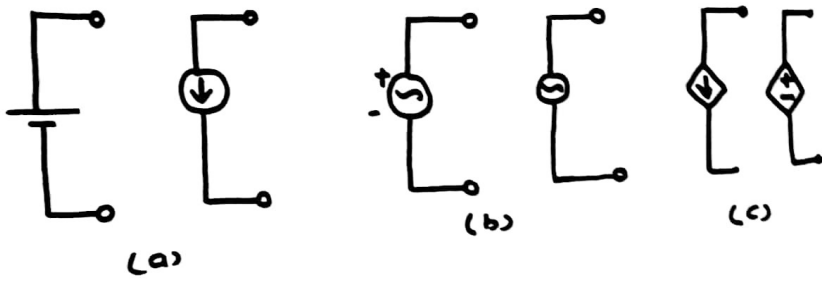


(A) $\frac{6}{5}$ V (B) $\frac{8}{5}$ V

(c) 6/7 V (C) 5/7 V

What is independent and what is dependent ?

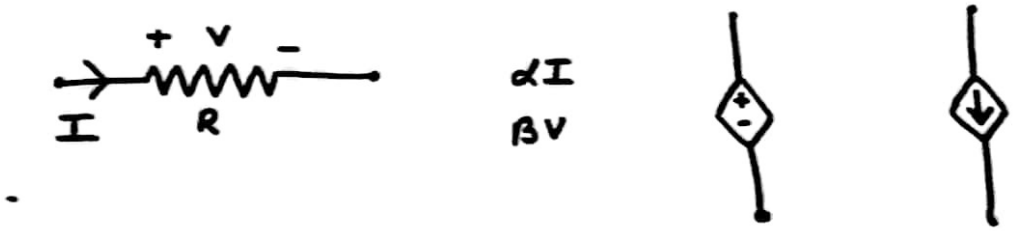
When the magnitude of a voltage or current source depends upon another parameter of the circuit



(a) Independent DC voltage and current source (b) Independent AC voltage and current source

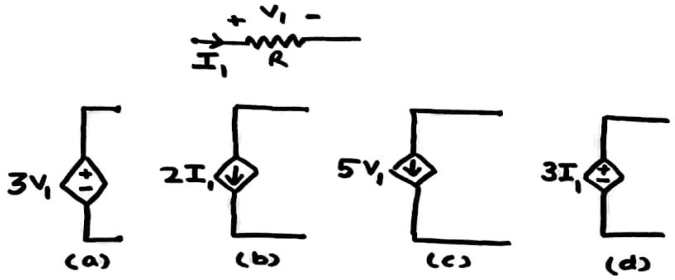
(b) dependent DC voltage and current source

Concept behind the dependent source



- Symbol- Type of source
- Magnitude- dependent quantity

Types of dependent source



(a)VDVS (b)CDCS (c)VDCS (d)CDCVS

*In case of dependent source same rule is applied as on independent source for solving a circuit proble

Example

Find I_1 & V_1

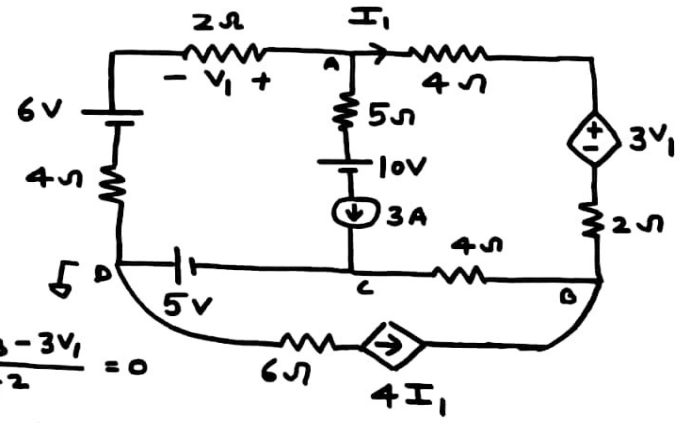
NODE - A, B, C, D

VOLTAGE - V_A, V_B, V_C.

D & C make supernode

$V_C = -5V$

Unknown V_A, V_B, I_1, V_1



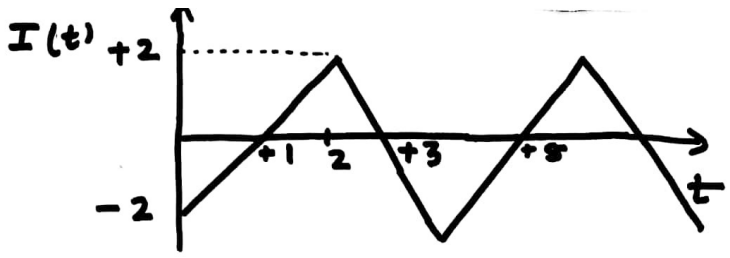
③ NODE A

$$\frac{V_A-6}{2+4} + 3 + \frac{V_A-V_B-3V_1}{4+2} = 0$$

④ NODE-B $\frac{V_B-V_A+3V_1}{2+4} + \frac{V_B-V_C}{4} - 4I_1 = 0$

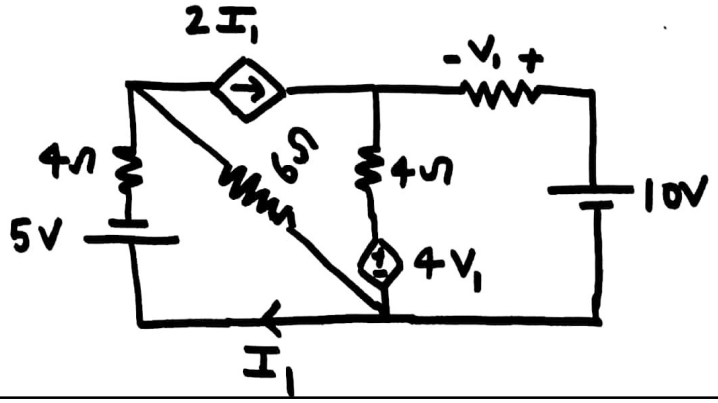
$V_1 = 2\left(\frac{V_A-6}{4+2}\right)$, $I_1 = \frac{V_A-3V_1-V_B}{4+2}$

Tutorial Sheet:

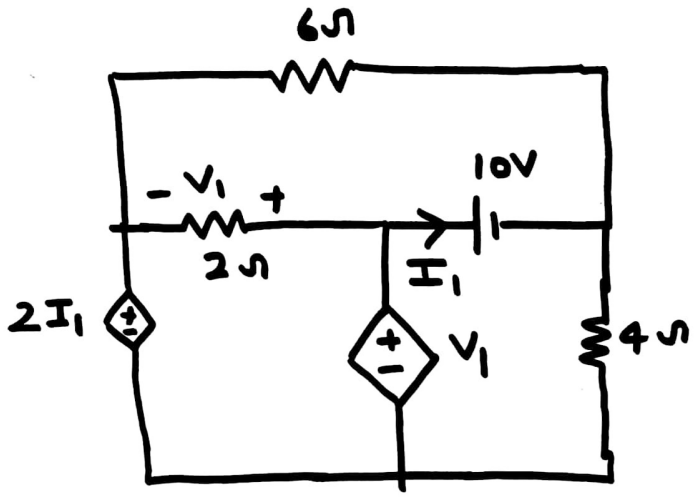


(a) If I(t) current across 2mH inductor calculate voltage V(t)

(b) Calculate V1 and I1 as shown in figure



(c) Calculate V1 and current in 4 ohm resistance



In Next Lecture

- Answer of tutorial seat Problem
- Concepts of super mesh analysis
- A seat of numerical examples

Thank you