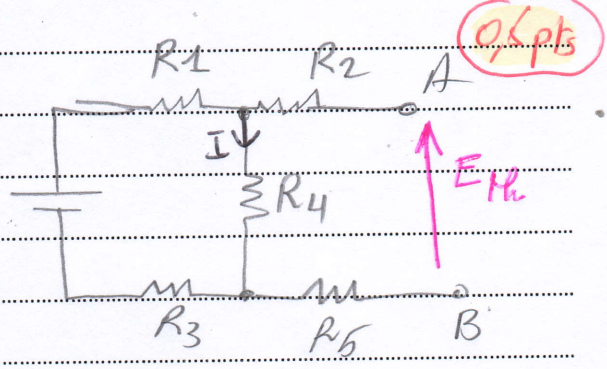
# Exam Correction 2023/2024

## Ex 1 : 7pts

$I_{AB}$ = ? by using Thevenin Theorem

1) $E_{Th}$ = ? & $R_{Th}$ = ?




0,5pts

$E_{Th} = R.I$ ——— ① 0,5pts

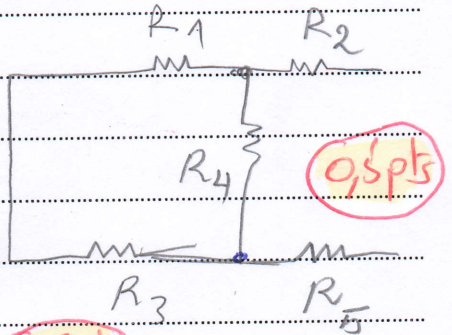
$I = \frac{E}{R_1 + R_3 + R_4}$ ——— ② 0,5pts

eq② in eq①, we obtain:

$E_{Th} = \frac{R_4}{R_1 + R_3 + R_4} . E$ 1pt

NA: $E_{Th} = \frac{10}{5+5+10} . 30 = 15V$ 0,5pt

$R_{Th}$ = ?

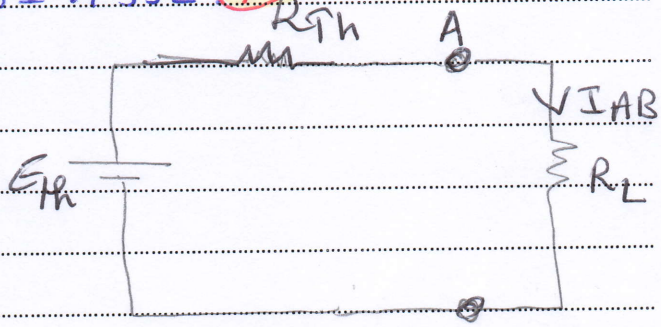



0,5pts

$R_{Th} = [(R_1 + R_3) // R_4] + R_2 + R_5$ 1pt

NA: $R_{Th} = [(5+5) // 10] + 4 + 6 = 15\Omega$ 0,5pts

$I_{AB}$ = ?




$I_{AB} = \frac{E_{Th}}{R_{Th} + R_L}$ 1pt

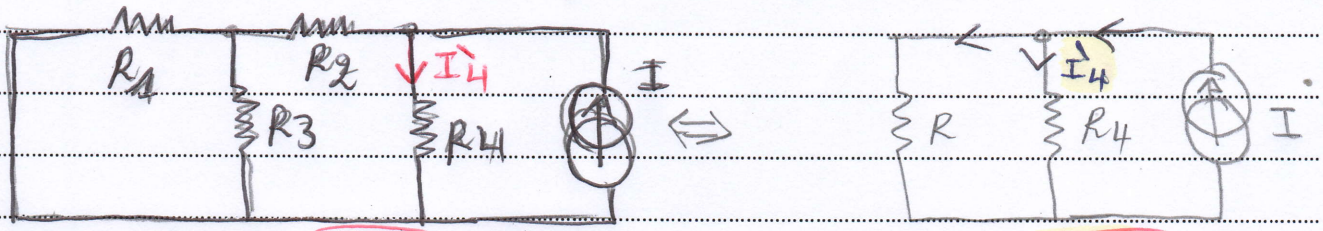
NA: $I_{AB} = \frac{15}{15+5} = \frac{15}{20} = 0,75A$

$I_{AB} = 0,75A$ 1pt

Ex 2 : (7 pts)

$I_4$ =? by using superposition theorem. (2,25)

1) 1st case: The voltage source E is discarded $I'_4$ =?



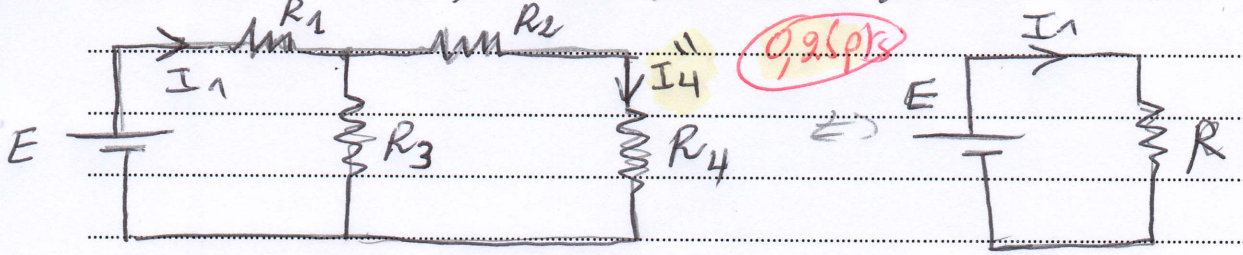

(0,5 pts) (0,25 pts)

$R = R_2 + (R_1 // R_3) = 10 + \frac{5 \times 10}{5+10} = 13,33\,\Omega$ (0,5 pts)

by using current divider: $I'_4 = \frac{R}{R+R_4} . I$ (0,5 pts)

NA: $I'_4 = \frac{13,33}{13,33+20} . 4 = 1,6\,A$

2) 2nd case: The current source I is discarded $I''_4$ =? (1,75)




(0,25 pts)

by using current divider $I_4 = \frac{R_3}{R_3 + (R_2+R_4)} I_1$ ——— ① (0,5 pts)

$I_1$ =?

$R' = [(R_2+R_4) // R_3] + R_1$ ——— ② (0,5 pts)

NA: $E = R I_1 \Rightarrow I_1 = E/R$ ——— ③ (0,5 pts)

eq ② in eq ③ : $I_1 = E / [(R_2+R_4) // R_3]$ ——— ④ (0,5 pts)

eq ④ in eq ①, we obtain:

$I''_4 = \frac{R_3}{R_3+(R_2+R_4)} . \frac{E}{(R_2+R_4) // R_3}$ (0,5 pts)

NA: $R = 30 // 10 + 5 = 12,5\,\Omega$ (0,5 pts)

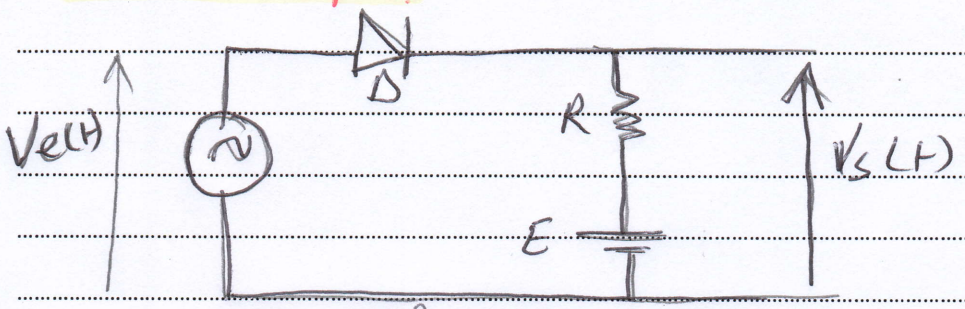
$I''_4 = \frac{10}{10+10+20} . \frac{20}{12,5} = 0,4\,A$. (0,5 pts)

$I_4 = I'_4 + I''_4$ (0,5 pts)

NA: $I_4 = 1,6 + 0,4 = 2\,A$

$I_4 = 2\,A$ ——— (0,5 pts)

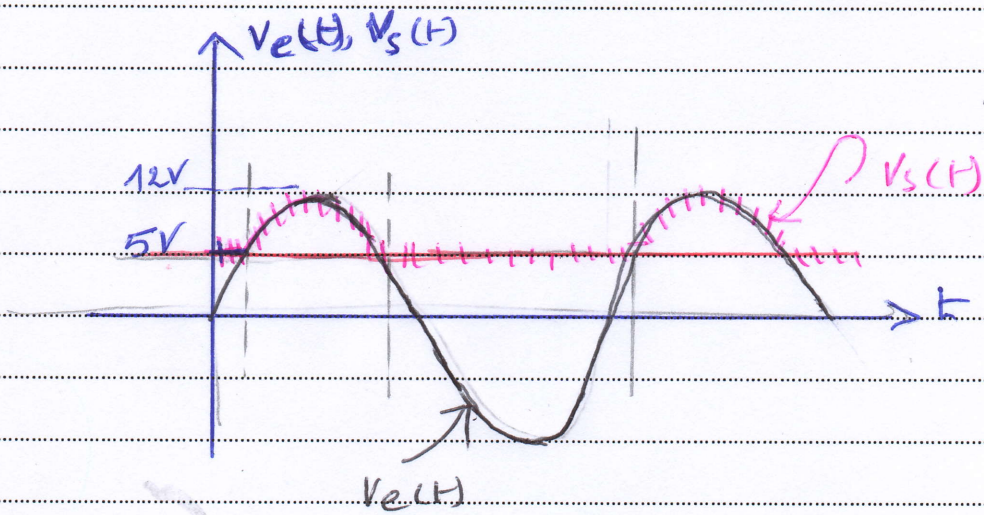
## Ex 3 (6pts)




Circuit Analysis.

1] A+ $\begin{cases} \rightarrow V_e(t) > 5V \Rightarrow D \text{ on} \Rightarrow V_s(t) = V_e(t). \quad (1,5 \text{ pts}) \\ \rightarrow V_e(t) < 5V \Rightarrow D \text{ off} \Rightarrow V_s(t) = 5V. \quad (1,5 \text{ pts}) \end{cases}$

2] $A^- \Rightarrow D \text{ off} \Rightarrow V_s(t) = 5V$. (1,5 pts)




(1,5 pts)