SYNTAX .tran sampling gap <t/10> display range <10t> UIC (use initial condition)

CODE :- (Transient analysis)

```
series RL circuit  <first line does not interpret>
V 1 0 DC 1
R 1 2 2K
L 2 0 50m
.tran 2.5u 250u UIC
.probe
.end
```

~~→ Time constant~~

$$\frac{L}{R}$$

$R \times C$

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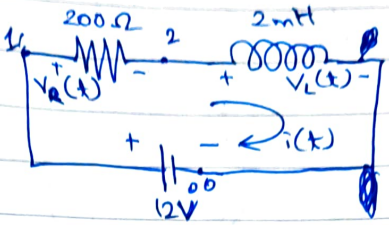
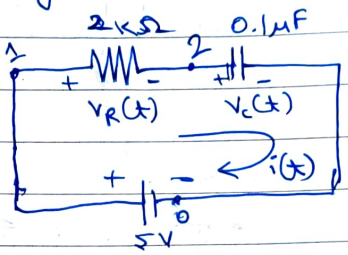
LAB DAY 2

Q-1- Plot $i(t)$, $V_R(t)$ and $V_L(t)$ for the given series RL circuit using PSPICE.



Q-2- Plot $i(t)$, $V_R(t)$ and $V_C(t)$ for the given series RC circuit using PSPICE.



ANSWERS:-

1. $\tau = \frac{L}{R} = \frac{2\ mH}{200\ \Omega} = \frac{2 \times 10^{-3}}{100} = 10^{-5}$ s

1. $\tau = \frac{L}{R} = \frac{2\ mH}{0.2K\Omega} = \frac{10 \times 10^{-3}}{10^{3} \cdot 1} = 10^{-5}$ s

Display range = $10\tau = 10^{-4}$ s

Sampling gap =

1. $\tau = \frac{L}{R} = \frac{2\ mH}{0.2K\Omega} = 10^{-5}$ s = 10 μs

Display range = 10τ = 100 μs

Sampling gap = $\frac{10}{100}$ = 1 μs

CODE :-

```
System LR circuit
V 1 0 DC 12
R 1 2 200
L 2 0 2m
.tran 1u 100u UIC
.probe
.end
```

---

(2) $\tau = R \times C = 2 \times 0.1 = \underline{0.2 \text{ ms}}$

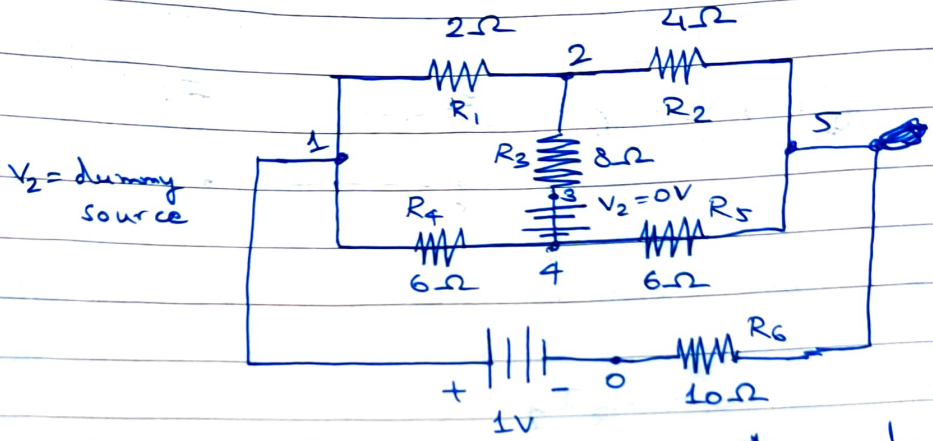
Display range $= 10\tau = \underline{2 \text{ ms}}$

Sampling gap $= \frac{\tau}{10} = \frac{0.2 \text{ m}}{10^5} = \underline{0.02 \text{ ms}}$

```
System RC circuit
V 1 0 DC 5
R 1 2 2K
C 2 0 0.1u
.tran 0.02m 2m UIC
.probe
.end
```

LAB

4. Find out the current through the 8Ω resistor in the given circuit using pspice and also verify reciprocity theorem.



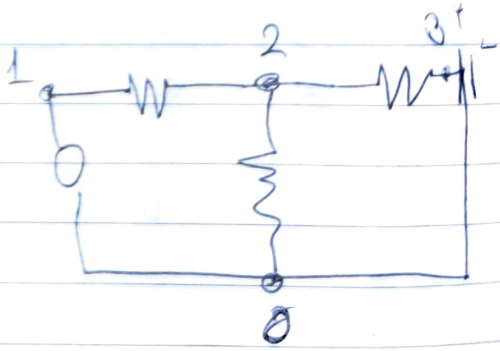
V_2 = dummy source

DC analysis → Operating point analysis

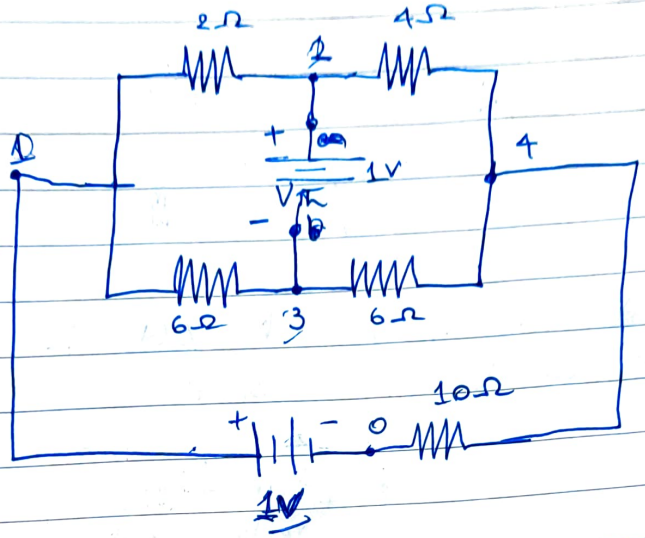
→ .op (b)
→ view simulation output
→ node voltages (listed)
→ current through voltage sources

Ans: DC Analysis

```
V1   1  0  DC  1
V2   3  4  DC  0
R1   1  2   2
R2   2  5   4
R3   2  3   8
R4   1  4   6
R5   4  5   6
R6   5  0  10
.op
.end
```



(5.) Find out V_{Th} and R_{Th} for the given circuit between terminals A and B, using Pspice



$V_{Th} = V(2) - V(3)$

$= 0.9048 - 0.8571$

$= 0.0477\ V$

$R_{Th} = \frac{1V \text{ (connected voltage)}}{I}$

$= \frac{1}{2.266 \times}$

$= 4.41\ \Omega$

```
V   1  0   DC  1
R1  1  2   2
R2  2  4   4
R3  1  3   6
R4  3  4   6
R5  4  0   10
.op
.end
```

```
V   1  0   DC  1
R1  0  1   2
R2  1  3   4
R3  0  2   6
R4  2  3   6
R5  3  0   10
.op
.end
```

$\frac{0.0477}{1.079 \times 10^{1}}$ $\frac{4.77}{1.079}$

$I_{sc} = 1.079 \times 10^{-2}\ A$

$\Rightarrow I_N$

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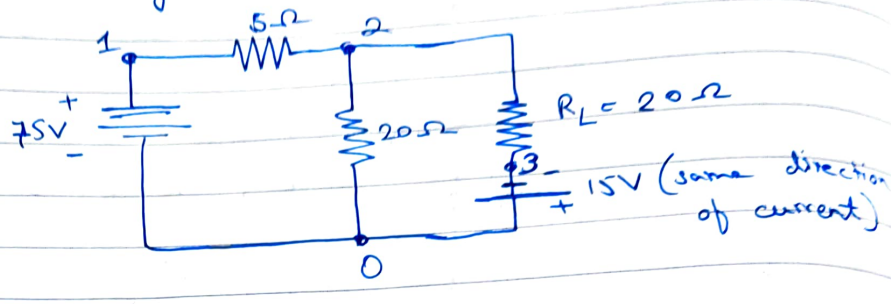
LAB:

(6) Verify the compensation theorem using pspice for the following circuit, when value of the load R increases by 30%.

Ans:-



$R_L = 20\Omega$, $I = 2.5A$

$R_L + \Delta R = 26\Omega$, $I_1 = 2A$

$\therefore V = I \times \Delta R$

$= 2.5 \times 6 = \boxed{15V}$

CODE:-

1st case (dummy source)

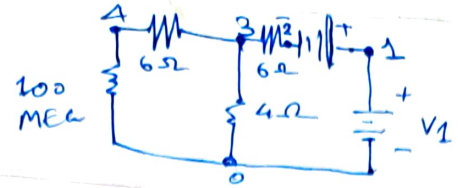
Compensation
V1 1 0 DC 75
V2 0 3 DC 0
R1 1 2 5
R2 2 0 20
R3 2 3 20
.op
.end

2nd case (30% output)

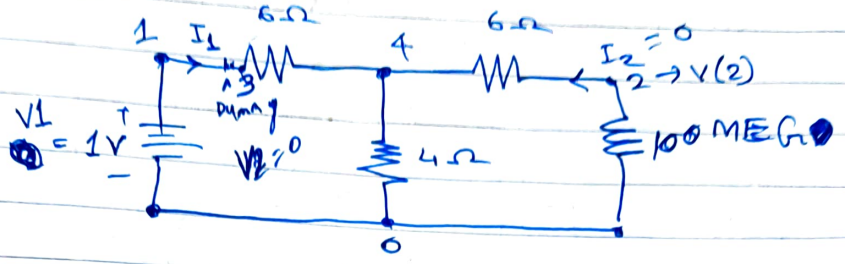
—
—
—
—
—
R_3 2 3 26
.op
.end

3rd case (voltage source added)

V_2 3 0 DC -15
—
—
—
—
.op
.end



7. Find out Z parameters for the given network using pspice.



Ans: $Z_{11} = 10\Omega$, $Z_{12} = 4\Omega$, $Z_{21} = 4\Omega$, $Z_{22} = 10\Omega$

$V_1 = Z_{11} I_1 + Z_{12} I_2$

$V_2 = Z_{21} I_1 + Z_{22} I_2$

Let $I_2 = 0$, $\therefore Z_{11} = \frac{V_1}{I_1}$, $Z_{21} = \frac{V_2}{I_1} \Rightarrow Z_{11} = 10, Z_{21} = 4$

Let $I_1 = 0$, $\therefore Z_{12} = \frac{V_1}{I_2}$, $Z_{22} = \frac{V_2}{I_2} \Rightarrow Z_{21} = 10, Z_{22} = 4$

for $I_2 = 0$,

```
V1  1  0  DC  1
V2  1  3  DC  0
R1  3  4  6
R2  4  2  6
R3  4  0  4
R4  2  0  100MEG
.op
.end
```

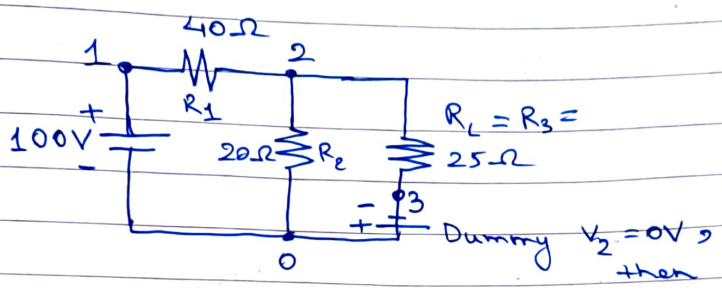
for $I_1 = 0$,

```
V1  1  0  DC  1
V2  1  2  DC  0
R1  2  3  6
R2  3  4  6
R3  3  0  4
R4  4  0  100MEG
.op
.end
```

14/9/23

TEST
LAB (3) COMPENSATION THEOREM

(3) Verify Compensation Theorem using PSpice for the following circuit when the value of load resistance decreases by 20%.



Ans-

$R_L = 25\,\Omega$

$R_L - \Delta R = 25\,\Omega - \frac{20}{100} \times 25\,\Omega = 20\,\Omega$

$I(R_L) = 0.8696\ A$

$I_1(R_L - \Delta R) = 1\ A$

$\therefore$ Voltage source needed $= \Delta R \times I$

$= 0.8696 \times 5\ V$

$= 4.3480\ V$

$= 4.35\ V$ (approx)

Voltage at V_2 was found to be 0.869 A again.

$\therefore$ Compensation Theorem verified

0.8696 × 5 = 4.3480

Dummy source	Dummy source with R_L change	Compensation voltage source added
V1 1 0 DC 100	V1 1 0 DC 100	V_1 1 0 DC 100
V2 3 0 DC 0	V2 3 0 DC 0	V_2 3 0 DC 4.35
R1 1 2 40	R1 1 2 40	R_1 1 2 40
R2 2 0 20	R2 2 0 20	R_2 2 0 20
R3 2 3 25	R3 2 3 20	R_3 2 3 20
.op	.op	.op
.end	.end	.end