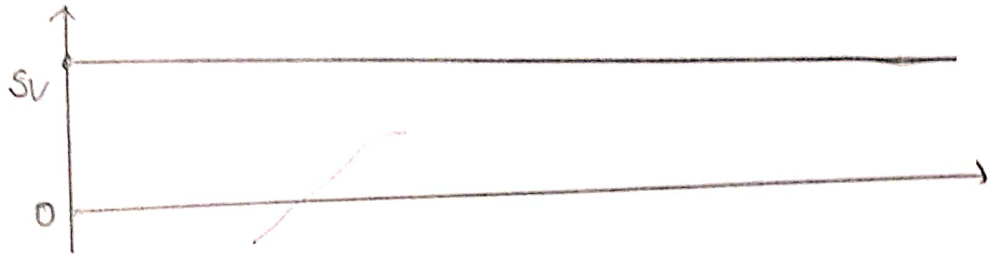
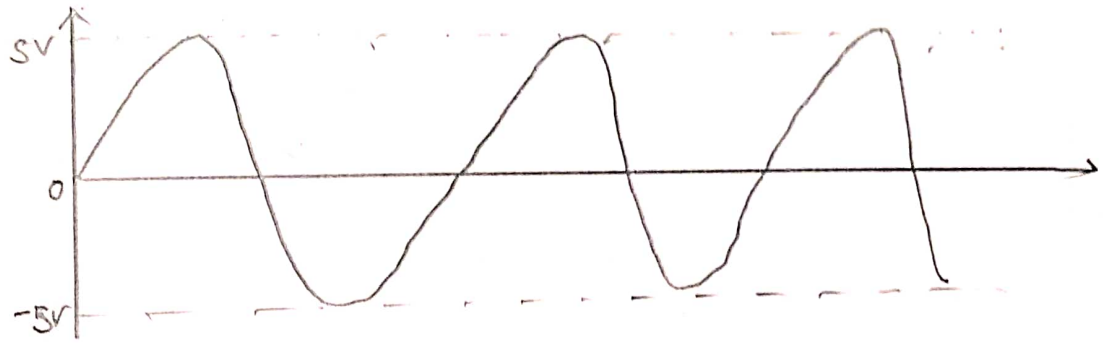
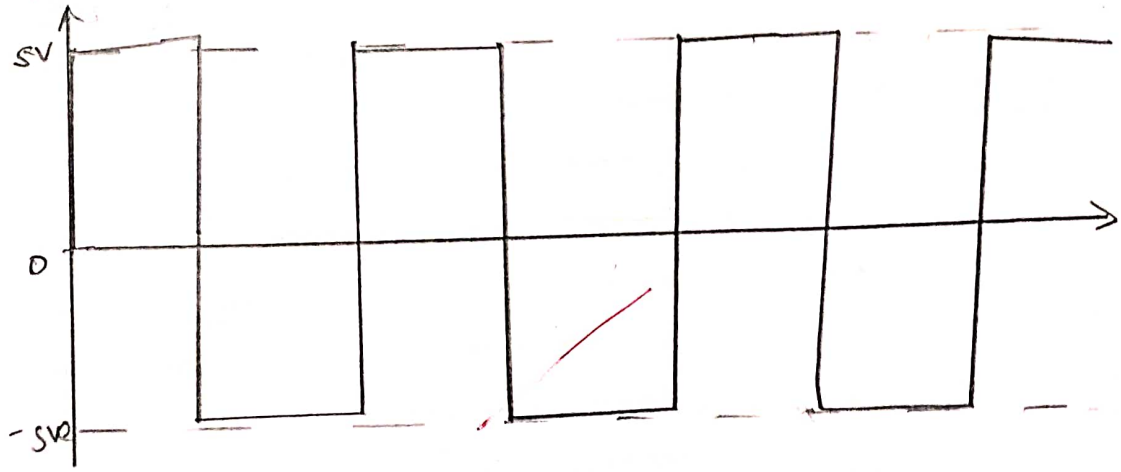
(i) DC Input.



(ii) AC Input



(iii) Transient / pulse train



13-01-2023

Lab - 01

Aim: Analysis of voltage divider and RC circuit on ngspice

Apparatus :- ngspice Software

Theory:

(i) DC Analysis:

This Analysis is used to analysis on for checking biasing conditions are set (or) not by giving dc Input to circuit.

(ii) AC analysis:

This Analysis is used to check the Range (or) In a given range circuit work (or) not by giving ac Input to circuit

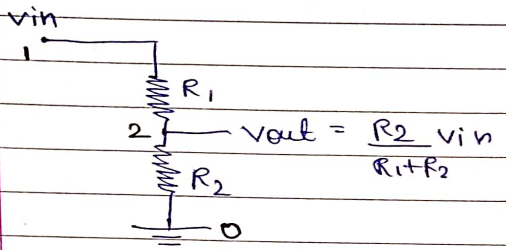
(iii) Transient analysis:

This Analysis is used to analysis the circuit with respect to time by giving pulse (or) pulse train as input to circuit.

Procedure:

1. Name the nodes of the circuits by one as Ground always.
2. Make netlist by nodes, ie the one (resistor) between which nodes
3. Now Give the Input as per AC (or) DC (or) Transient to the Circuit
4. Plot the Graphs between transfer (or) output characteristics.

Circuit - 1 :- [Single R - Circuit] (@) voltage divider.



Given Ground as 0
vin as 1 ; Resistors as 2 node

Code :-

1) DC - analysis

*** DC analysis
vin 1 0 5V
R1 1 2 8k
R2 2 0 2k
• dc vin 0 5 0.1
• Control
run
Plot V(1), V(2) → // Plot across voltages at node 1, 2
• end c
• end

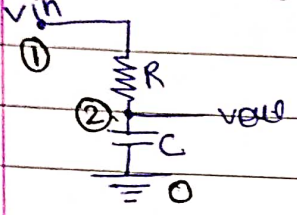
2) AC - analysis

*** AC analysis
vin 1 0 dc 0 ac 5
R1 1 2 8k
R2 2 0 2k
• ac dec 10 1 10k.
• Control
run
Plot V(1), V(2) ← Plot
• endc
• end

3) Transient analysis :

vin 1 0 pulse (0 5 0 0 0 100ms 200ms)
R1 1 2 8k
R2 2 0 2k.
• tran 0.2ms 1000ms. // 0.2ms → width
// 1000 ms → stop value
• Control
run
Plot V(1) V(2)
• end c
• end

Circuit -02:- [R-C Circuit]



R = 6k
C = 180μF

① DC-Analysis :-

```
*** DC Analysis
Vin 1 0 5V
R1 1 2 6K
C1 2 0 180UF
.dc Vin 0 5 0.1
.Control
run
Plot V(1), V(2).
.endc
.end.
```

② AC-analysis

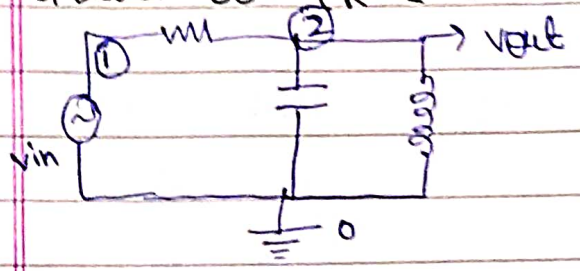
```
*** AC Analysis
Vin 1 0 dc 0 ac 5V
R1 1 2 6k
C1 2 0 180UF
.ac dec 10 1 10k
.Control
run
plot V(1), V(2)
.end c
.end.
```

③ Transient analysis :-

```
*** Trans Analysis
Vin 1 0 pulse (0 5 0 0 0 100ms 200ms)
R1 1 2 6k.
C1 2 0 180F
.tran 0.2ms 1000ms
.measure tran rtime TRIG V(1) val = 0.5 Rise = 1 TARG V(1) val = 4.5
.Control
run
plot V(1) V(2)
.endc
.end
```

Rise = 1
→ 1 for calculating Rise time.

Circuit - 03: (R-L-C Circuit).



R = 1·2k
C = 0·1 μF
L = 100mH.

① DC - Analysis

```
*** DC Analysis
Vin 1 0 5V
R1 1 2 1·2k
C1 2 0 0·1UF
L1 2 0 100mH
.dc vin 0 5 0·1
.Control
run
Plot V(1) V(2)
.end c
.end.
```

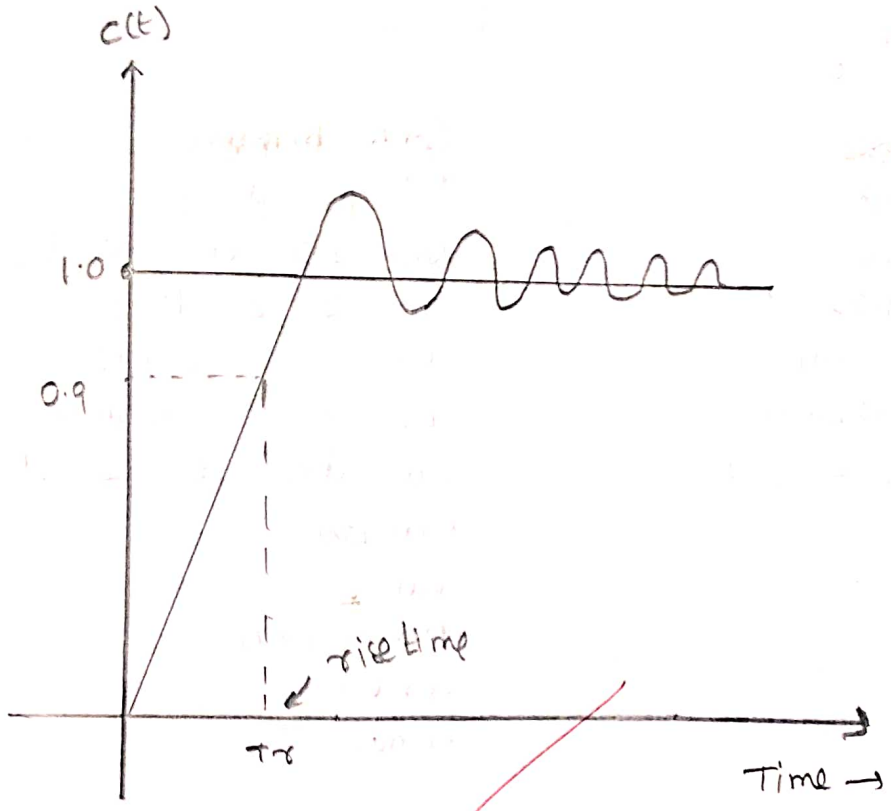
② AC - Analysis

```
*** AC analysis
Vin 1 0 dc 0V ac 5V.
R1 1 2 1·2k
C1 2 0 0·1UF
L1 2 0 100mH.
.ac dc 10 1 10k
.Control
run
Plot V(1) V(2)
.end c
.end.
```

③ Transient analysis

```
*** Tran analysis
Vin 1 0 pulse (0 5 0·00 100ns 200ns)
R1 1 2 1·2K
C1 2 0 0·1UF
L1 2 0 100mH
.tran 0·2ms 100ms
.Control
run
plot V(1) V(2)
.end c
.end
```

10% - 90%



Observations:

The all plots are observed on ngspice software between vin and vout and also rise time of the R-C circuit is given by.

γ time $= 1.6 \times 10^{-4}$, $t_{avg} = 1.8 \times 10^{-4}$, $t_{trig} = 2 \times 10^{-4}$.

Precautions:

1). Write code comands as per their original command format
2) For every code. First line is start with code name (or) Analysis name.
3) After first line continue with net-list.

Result/conclusion:

We have successfully analyized voltage divider in RC, RLC, R circuits on ngspice software and also plotted the graphs

A

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