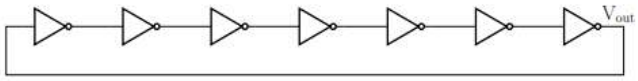
EE5311 Tutorial_4 Report

L.Pradeep EE22B074

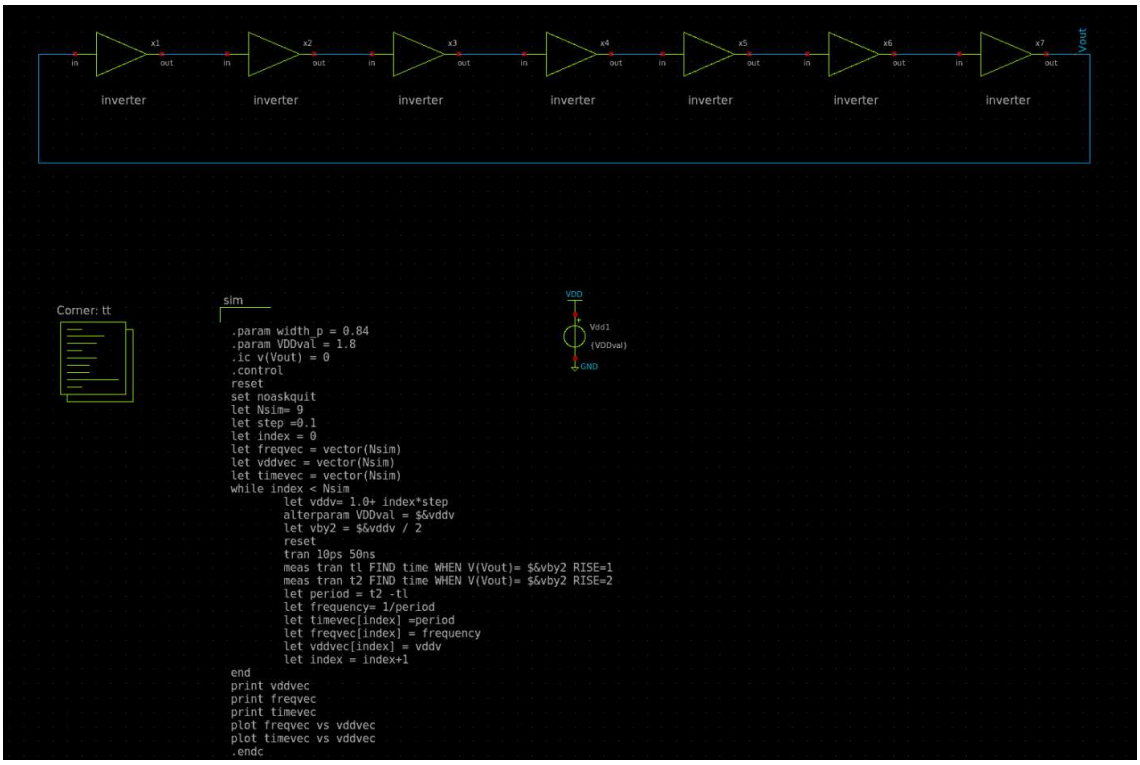
1. Using the CMOS inverter with the minimum delay from Assignment 3, construct a seven stage ring oscillator as shown below and find the oscillating frequency.



To ensure oscillation in the transient simulation, set the node $V_{out} = 0$V initially using: `.ic v(Vout)=0`

(a) Measure the oscillating frequency for $V_{DD} = 1.8$V.

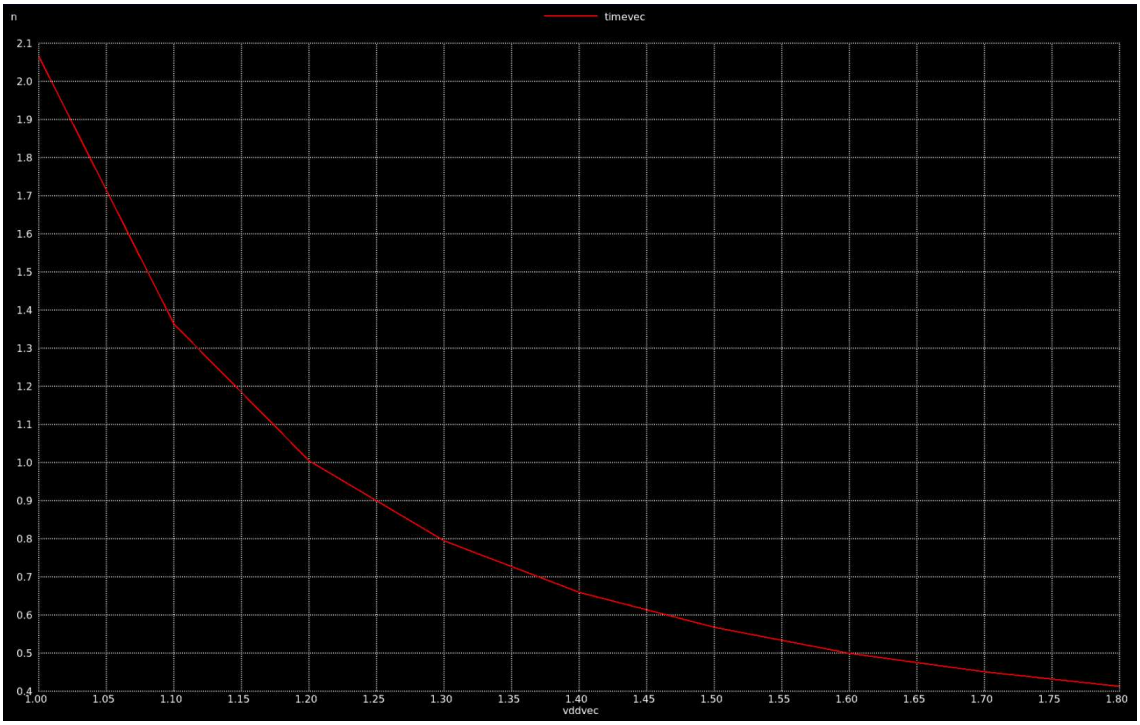
Part -B : SCHEMATIC



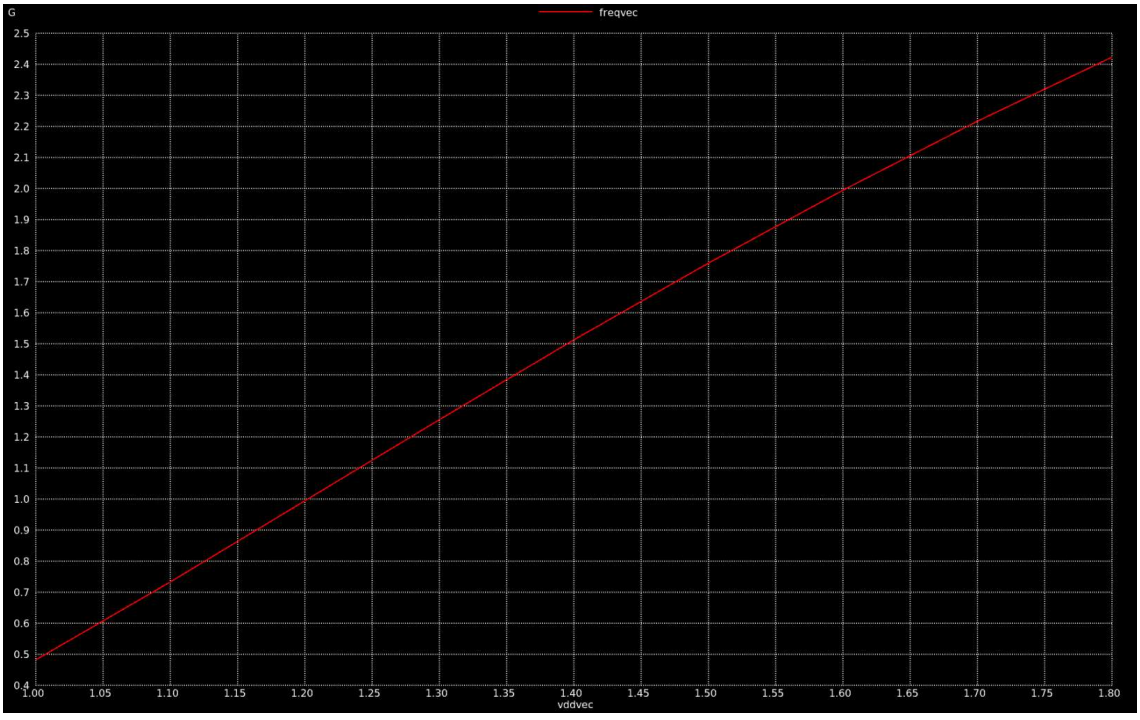

```
period = 4.124471e-10
frequency = 2.424553e+09
```

(b) Plot the oscillating frequency and time period as a function of V_{DD} for $V_{DD} = 1\text{V}$ to 1.8V in steps of 0.1V.

Measurements: B) Graph Time vs VDD

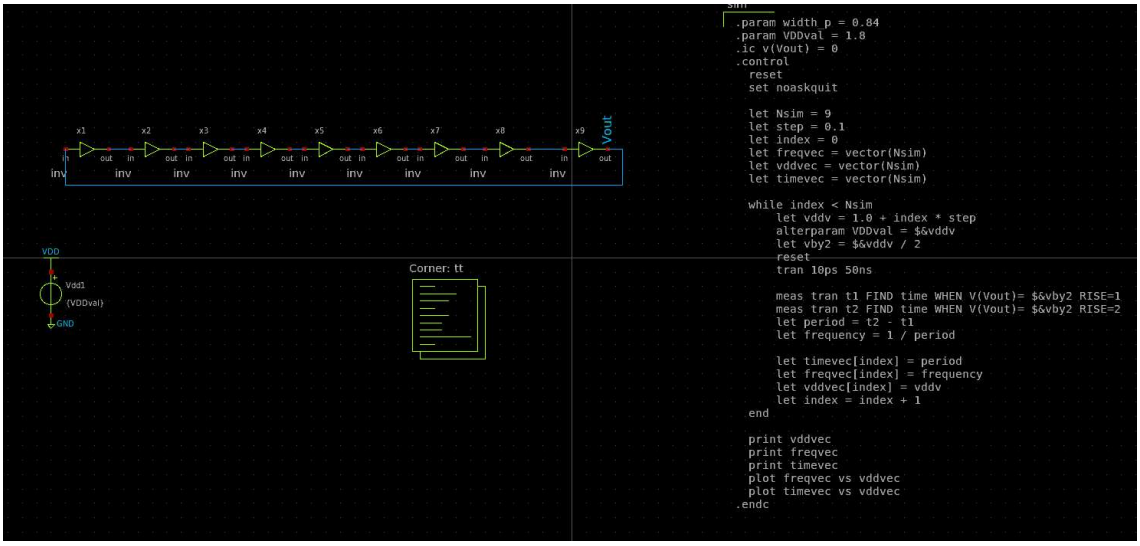


Frequency vs vDD

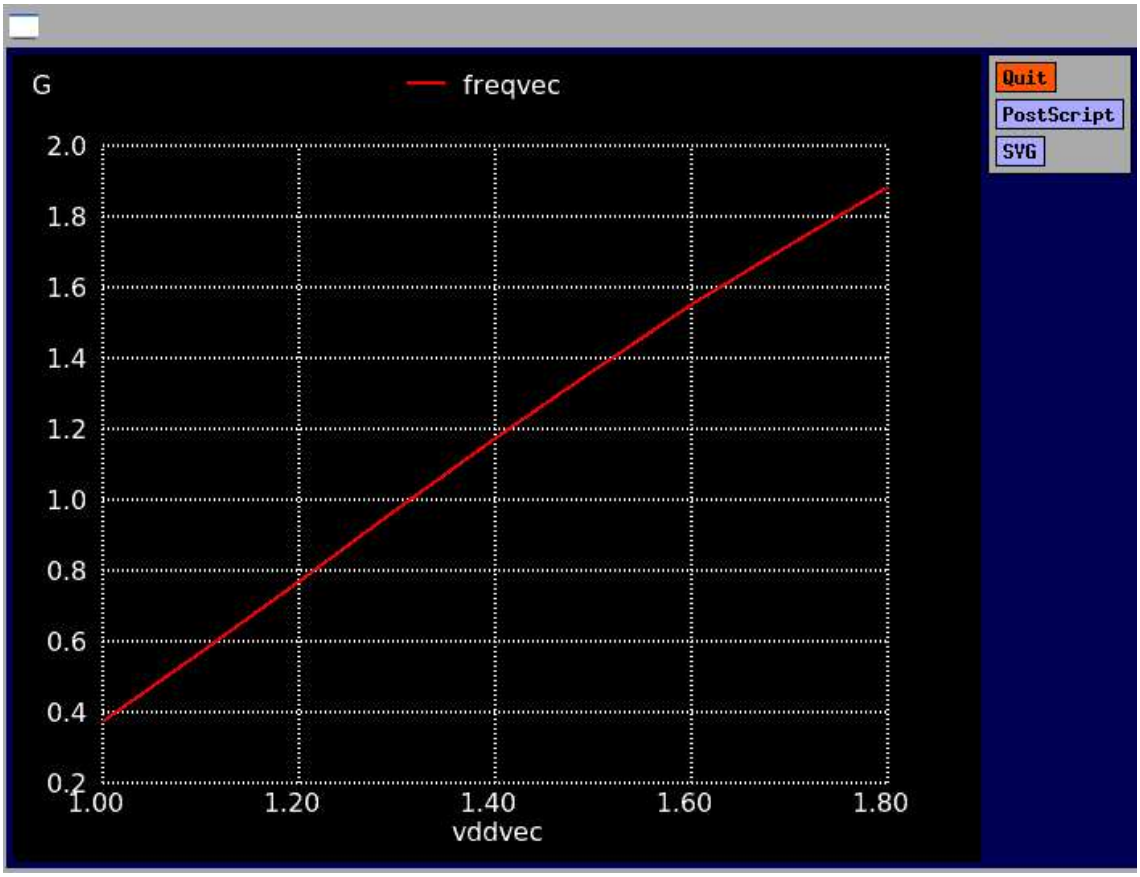


(c) Repeat the experiment (b) with nine inverter stages.

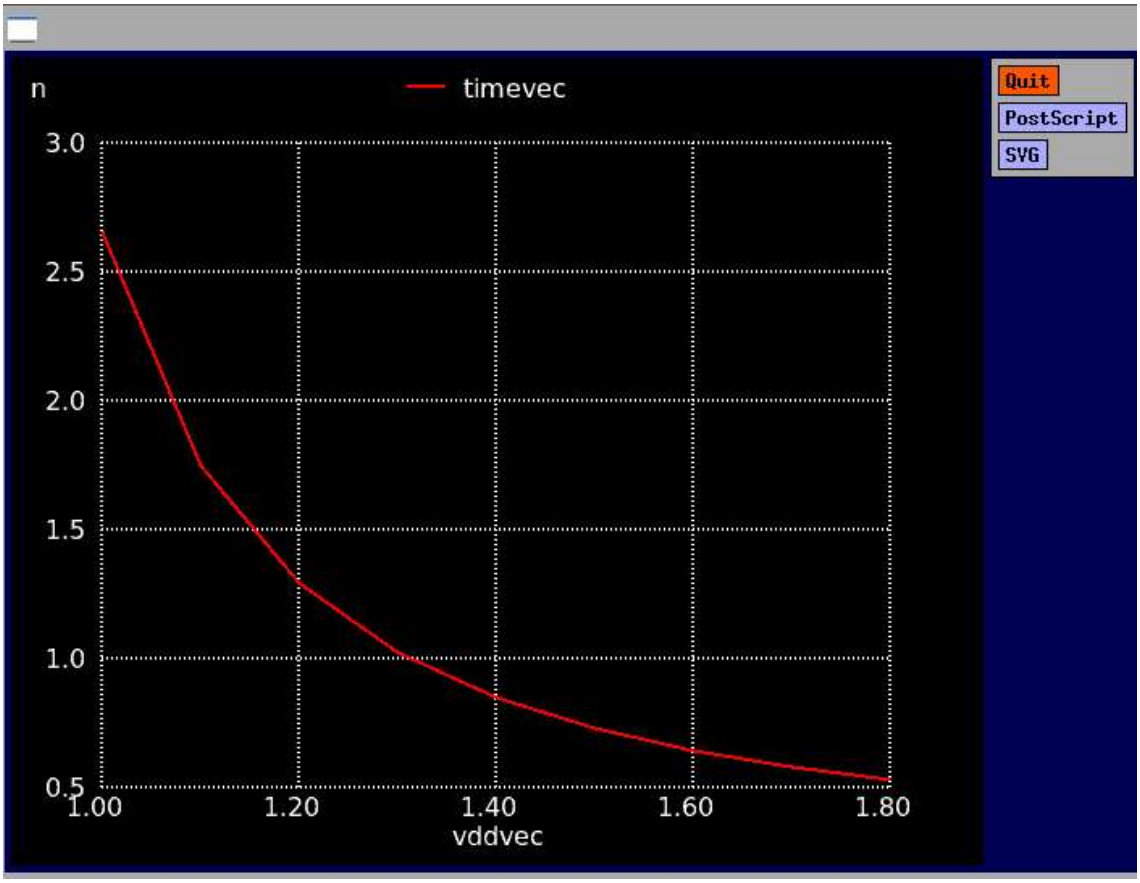
PART -C : SCHEMATIC



C) Frequency vs VDD



C) Time vs VDD


n
timevec
Quit
PostScript
SVG
3.0
2.5
2.0
1.5
1.0
0.5
1.00
1.20
1.40
1.60
1.80
vddvec