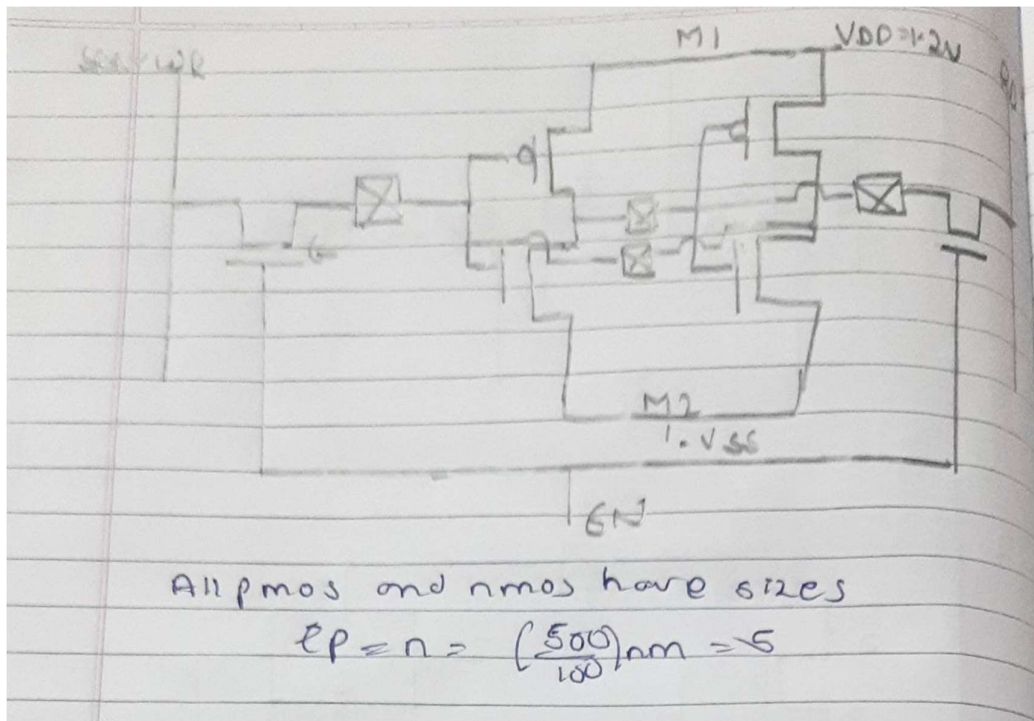


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Class	:	
Batch	:	
Roll. No	:	
ABC ID	:	
Assignment No.	:	B.4.a
Assignment Name	:	1-bit SRAM ( Using NMOS S/W )
Date Of Performance	:	

### MOSFET-LEVEL SCHEMATIC of 1-bit SRAM Cell Using NMOS S/W :-



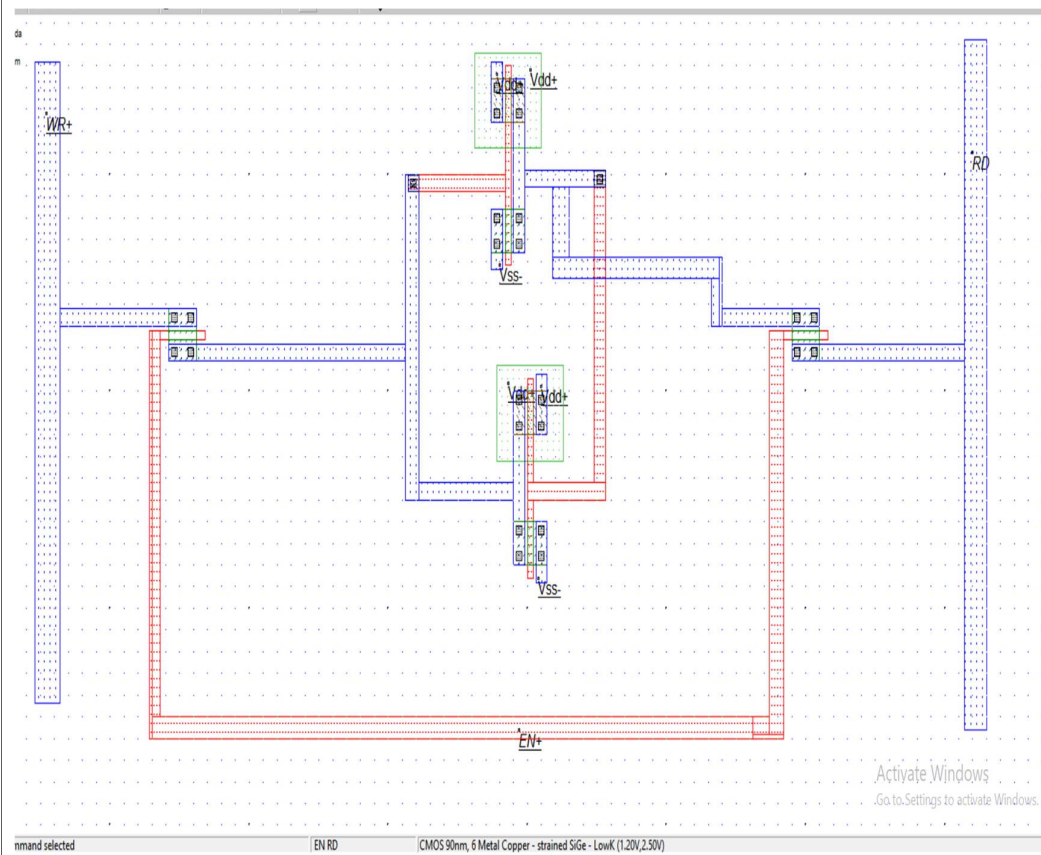
**In the above Schematic :**

- + N1 , N2 : NMOS S/W's
- + I1 , I2 : CROSS – COUPLED CMOS INVERTERS
- + System is NOT a PURE CMOS SYSTEM
- + WR-line gets connected to RD line through N1 , N2 & I1-I2 pair
- + N1 = N2 = ON / OFF , for EN = 1 / 0
- + N1 , N2 Transmit “1” as WEAK-1 & “0” as STRONG-0
- + I1 , I2 Transmit “1” as STRONG-0 , “0” as STRONG-1

**Truth Table:-**

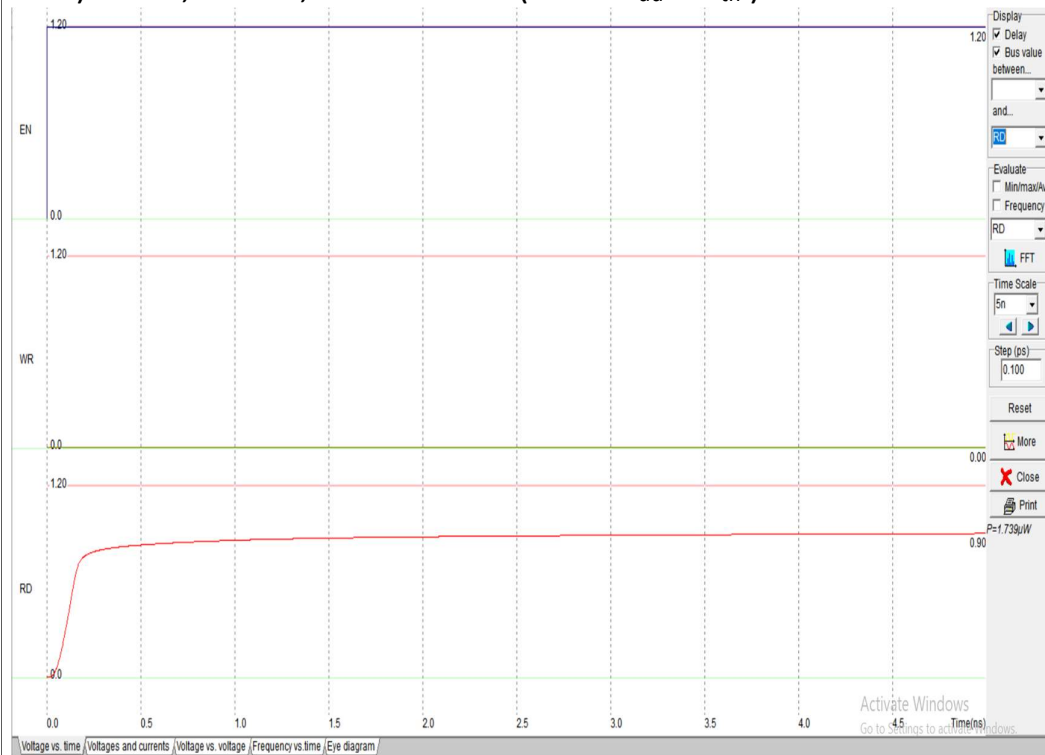
EN	WR	RD
1	0	WEAK-1 ( Unacceptable )
1	1	STRONG-0 ( Acceptable )
0	X	HOLD

## Layout (90 nm Foundry ) : ( $V_{dd} = 1.2\text{ V}$ )

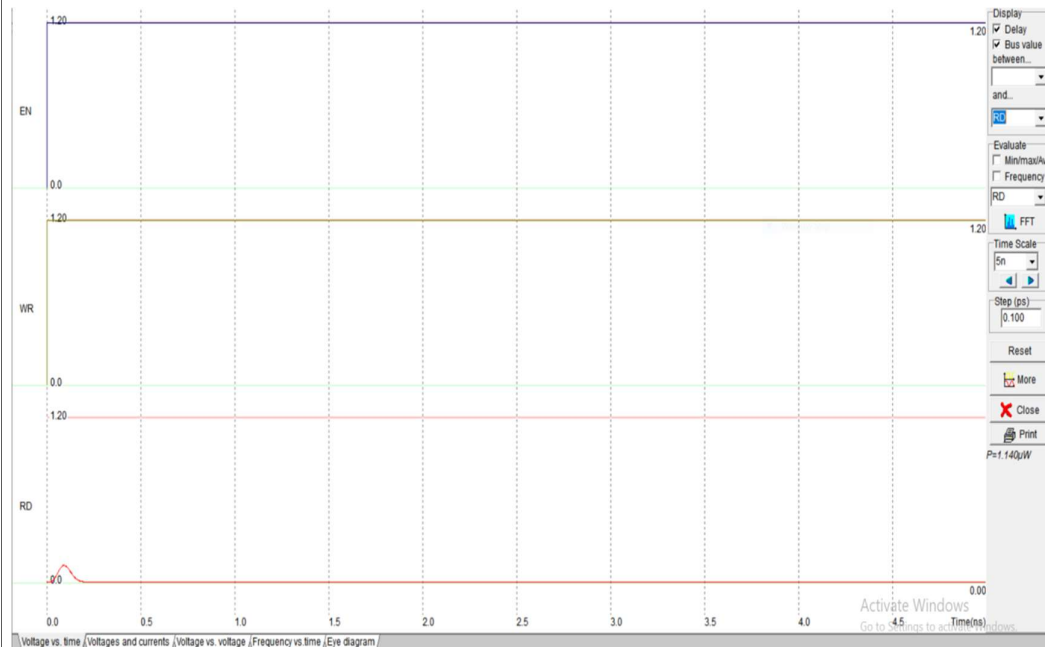


## Waveforms:

1)  $EN=1, WR = 0, RD = \text{Weak-1} (RD = V_{dd} - V_{tn}) = 0.9 \text{ V}$



2)  $EN=1, WR = 1, RD = \text{STRONG-0} (RD = -V_{ss}) = 0 \text{ V}$



The screenshot displays a circuit simulation software interface with three waveforms plotted over a 4.5 ns time period. The waveforms are labeled EN (blue), WR (green), and RD (red). The EN and WR waveforms are constant at 0.0 V, while the RD waveform shows a series of small pulses. The software interface includes a toolbar with options like Display, Delay, Bus value, and Evaluate, and a status bar at the bottom showing 'Voltage vs. time' and 'Time(ns)'.

- 1) Drawn the LAYOUT of 1-bit SRAM Cell Using NMOS S/W's for 90 nm Foundry.
- 2) Not being a **Pure-CMOS System** ( NMOS S/W's & CMOS INVERTERS ) , it gives **RD = W-1 / S-0** for **WR = 0 / 1** respectively.
- 3) So , **"0"** is READ as **W-1** ( *Unacceptable* ) & **"1"** is READ as **S-0** ( *Acceptable* )
- 4) ***The reason for above is the Presence of NMOS S/W's on both sides of CMOS INVERTERS ( A Pure CMOS System )***
- 5) Replacing N1 , N2 with P-Channel Devices P1 , P2 will give W-0 & S-1 on RD-Line.
- 6) Having ( N1 , P2 ) / ( P1 , N2 ) will give S-1 & S-0 on RD-Line , but will need an ADDITIONAL CMOS INVERTER to simultaneously TURN-ON both S/W's ,so not Acceptable.