**ECE 531**

**Microelectronics**

**Assignment 1**

**Aditya Sankaramanchi**

**101266059**

**Solution 2:**

Given Resistivity; thickness t=140nm

Width

1. Calculate Sheet Resistance

Sheet resistance

= 3 Ω/ sq

1. Line resistance = ? ; length = 240 µm

Line resistance L= 240 µm long

R = 1.2 kΩ

**Solution 3:**

Area Capacitance = 872 aF/(µm)^2

We have

872 =

Where ℇ = 3.97\*8.85

By solving d= 0.04029 µm

**Solution 4:**

Student ID : 101266059

Hence R=26 kΩ

C = 60 pF

circuit_11.wmf

Figure 1: RC series circuit with Ideal square-wave in LTSpice

circuit_1.wmf

Figure 2: Simulation result of RC circuit with ideal square wave as input

Result in SPICE Error Log:

fall\_time=3.46471e-006 FROM 5.24584e-006 TO 8.71055e-006

rise\_time=3.43997e-006 FROM 3.84493e-007 TO 3.82446e-006

Edit for clarity:

Fall\_time= 3.4 µs from 5.24 µs to 8.71 µs

Rise\_time=3.43 µs from 0.38 µs to 3.82 µs ---- (1)

RC time constant  = R\*C

= 26\* 10^3 \* 60 \* 10^-12

 = 156 \*

Rise time or fall time = 2.2 \* 

=3.432 \* = 3.432 µs ---- (2)

From expressions (1) and (2)

The rise times are equal. Hence the period chosen is 9 µs to get the valid results.

Hence Proved.

**Solution 5:**

To set the rise or fall time to the above obtained results

Putting rise time = 3.43 µs

fall\_time=3.44986e-006 FROM 1.28591e-005 TO 1.63089e-005

rise\_time=4.45151e-006 FROM 1.16009e-006 TO 5.61159e-006

The new rise time = 4.45 µs

The new fall time = 3.44 µs

**Solution 6:**

The AC response (magnitude and phase) as a function of frequency:

circuit_6.wmf

Figure 3: RC series circuit with sin wave as input in LTSpice

circuit_6_wave.wmf

Figure 4 : Simulation of magnitude and phase as a function of frequency. (Bode Plot)

Here the thick line represents the magnitude and the dotted line represents the phase.

The left vertical axis is magnitude in dB and the right vertical axis is phase in degrees.

The x axis is the frequency in Hz.