Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(VLSI D) (2016 & Onwards) (Sem.–1)

VLSI DESIGN CONCEPTS

Subject Code : MTVL-102

Paper ID : [74141]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

Q1. Consider a MOS system with the following parameters : (20)

$T_{OX} = 200Å$

$\phi_{GC} = -0.85$ V

$N_A = 2\times10^{15}$ cm^{-3}

$Q_{0x} = q\ 2\times10^{11}$ C/cm^2

a) Determine the threshold voltage V_{TQ} under zero bias at room temperature (T = 300 K). Note that $\varepsilon_{ox} = 3.97\ \varepsilon_0$ and $\varepsilon_{si} = 11.7\ \varepsilon_0$.

b) Determine the type (p-type or n-type) and amount of channel implant (N_1/cm^2) required to change the threshold voltage to 0.8 V.

Q2. Draw the Voltage transfer characteristics of CMOS inverter circuits with labeling of all different regions. Also, explain the state of driver and load transistor in different regions Also calculate the V_{OH} for CMOS inverter. (20)

Q3. Design a circuit to implement the same logic function as shown in Fig. 1. but using NOR gates. Draw a transistor level schematic and use nMOS enhancement depletion (E-D) technology. (20)

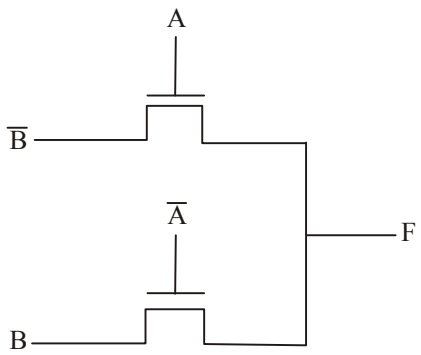

Fig.1

Q4. a) Briefly outline the needs for low power VLSI chips. (5)

b) Derive the equation for power dissipation in digital VLSI circuits, taking into account the charging and discharging of capacitances in CMOS circuits. (10)

c) Explain the different sources of power dissipation in CMOS circuits. (5)

Q5. With relevant response curves explain the transmission gate output characteristics for change in control input and for change in switched input. (20)

Q6. List out advantages of CMOS over nMOS by giving an example of inverter circuit. (20)

Q7. Explain the difference between VTCMOS circuits and MTCMOS circuits. (20)

Q8. Explain what is the impact of transistor sizing, oxide thickness and technology scaling on low power electronics? (20)