Don Bosco Institute of Technology, Kurla(W), Mumbai

EEC503: Digital VLSI
AY 2024-2025
IA-1 Question Bank

Two marks questions

1. Write equation of drain current for NMOS transistor for cut-off region, linear region, and saturation region along with conditions.
2. Write equation of drain current for PMOS transistor for cut-off region, linear region, and saturation region along with conditions.
3. List various short channel effects in short channel MOSFET
4. List various process used in the fabrication of MOSFET
5. Tabulate all parameters of MOSFETs before CVS and after CVS
6. Tabulate all parameters of MOSFETs before CFS and after CFS
7. List various masks used in the fabrication process of NMOS transistor in the order of their use.
8. Numerical based of MOSFET current equations.
9. Numerical based on MOSFET scaling equations.
10. Draw cross section of MOSFET after processing of Metallization Mask along with metallization mask
11. Draw cross section of MOSFET after processing of Gate Mask along with metallization mask
12. Define long channel MOSFET and short channel MOSFET
13. What is difference between wet oxidation and dry oxidation? Where these processes are used during MOSFET fabrication.
14. Draw cross sections of all masks used in NMOS fabrication.
15. Explain hot carrier effect.
16. Explain Drain Induced barrier Lowering effect
17. What is velocity saturation and what is its impact of MOSFET performance
18. Draw VTC of CMOS inverter and locate all critical points on the same.
19. Define V_{IL}, V_{IH}, V_{OH}, V_{OL} and V_{INV} w.r.t VTC of CMOS Inverter
20. In CMOS inverter VDD=3.3V, K_n=150uA/V^2 and K_p=75uA/V^2, V_{TN}=0.7V and V_{TP}=-0.7V Find V_{OH}, V_{OL}, V_{INV}

Five Marks Questions

1. Differentiate between Constant Voltage Scaling and Constant field Scaling with respect to I_{DSlin}, I_{DSsat}, Power, Area, Delay, Power Density.
2. Give fabrication flow of NMOS transistor with appropriate cross-sections and masks
3. Define constant voltage scaling and explain its impact on MOSFET parameters by deriving necessary equations
4. Define constant field scaling and explain its impact on MOSFET parameters by deriving necessary equations
5. By deriving expressions prove that delay of MOSFET reduces by factor of S^2 (S square) and by S in case of Constant Voltage Scaling and Constant Field Scaling respectively. S is scaling factor
6. Give fabrication flow of PMOS transistor with appropriate cross-sections and masks
7. Draw circuit diagram of CMOS inverter and VTC and explain its working
8. Draw circuit diagram and VTC of CMOS inverter and derive expression for V_{IH} and V_{IL}