

VIT[®]

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test I – January 2025

Programme	: B.Tech (ECE)	Semester	: WS 2024-25
Course	: VLSI System Design	Code	: BECE303L
		Class Nbr	: CH2024250502913 CH2024250502914 CH2024250503037
Faculty	: Dr. A. Ravi Sankar, Dr.S.Umadevi, Dr. Pritam Bhattacharjee	Slot	: E1+TE1
Time	: 90 Minutes	Max. Marks	: 50

General Instructions:

Write only your registration number on the question paper in the box provided and do not write other information

Answer ALL the questions

Q.No.	Sub. Sec.	Questions	Marks	BT LEVEL
1	1	i. With the neat sketch discuss about semicustom VLSI design flow. ii. Elucidate Moore's Law and classify the different integrated circuit (IC) technologies based on their transistor count.	10 [7+3]	L1
2	5	Derive the expression for the drain current of an N-channel enhancement-type MOSFET from first principles, also indicate the change in the drain current expression due to velocity saturation and channel length modulation.	10	L2
3	10	Consider the nMOS transistor which has $W/L = 2$. In this process, the gate oxide thickness is $12\text{\AA}$. The mobility of electrons is $80\text{cm}^2/\text{V}\cdot\text{s}$. The threshold voltage is 0.3V . Plot I_{ds} vs. V_{ds} for the following cases. i. $V_{gs} = 0.5\text{V}$ with $V_{ds} = 0.1\text{V}$ and $V_{ds} = 0.6\text{V}$ ii. $V_{gs} = 0.8\text{V}$ with $V_{ds} = 0.1\text{V}$ and $V_{ds} = 0.6\text{V}$ (Given: $\epsilon_{\text{oxide}} = 3.9 \times \epsilon_0$ where $\epsilon_0 = 8.85 \times 10^{-14}\text{F/cm}$.)	10	L4
4	5	Plot the Voltage Transfer Characteristics (VTC) of a static CMOS inverter and clearly indicate the various regions along with the operating conditions of both the pMOS and nMOS transistors. Provide the expressions for the input and output transition points corresponding to the various operating regions of the inverter.	10	L3
5		Consider the CMOS inverter shown in Figure 1. Assume $V_{DD} = 2\text{V}$ $V_{thn} = V_{thp} = 0.5\text{V}$, $\left(\frac{W}{L}\right)_n = \frac{2\mu\text{m}}{1\mu\text{m}}$, $\left(\frac{W}{L}\right)_p = \frac{2\mu\text{m}}{1\mu\text{m}}$, $\mu_n C_{ox} = 200 \frac{\mu\text{A}}{\text{V}^2}$, $\mu_p C_{ox} = 100 \frac{\mu\text{A}}{\text{V}^2}$, $\lambda_{n,p} = 0$, $\gamma_{n,p} = 0$. i. Find the input transition voltage ii. Find the output voltage for (i) $V_i = 0.6\text{V}$ (ii) $V_i = 1.2\text{V}$	10 [2+8]	L4

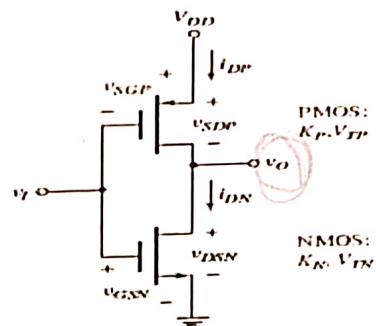


Figure 1

Total Marks

50

Course Faculty