Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 09-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B.Tech-ECE/B.Tech-VLSI/B.Tech-VLSI design & Technology	
Course Code : ECE3167	**Course Name:** VLSI Design	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**28**	**12**	**10**			

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

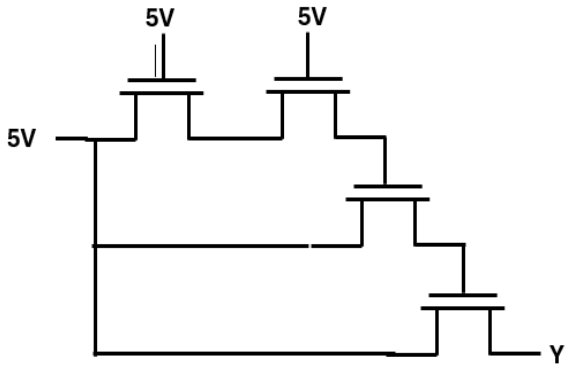
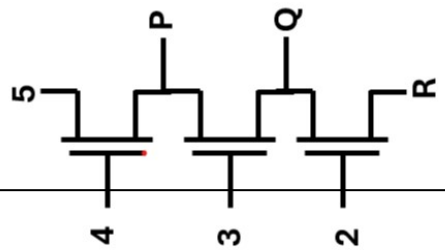
1	Define work function.	**2 Marks**	**L1**	**CO1**
2	Differentiate depletion type and enhancement type MOSFET.	**2 Marks**	**L1**	**CO1**
3	Draw the MOS spice model using square law I-V characteristics.	**2 Marks**	**L1**	**CO1**
4	Mention any four differences between long and short channel devices.	**2 Marks**	**L1**	**CO1**
5	Draw the stick diagram for the CMOS inverter.	**2 Marks**	**L2**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	The main working principle of a MOSFET is to control the voltage and the current which is flowing between the source terminal and the drain terminals. Explain all three regions of n-channel MOSFET with neat diagrams.	**10 Marks**	**L2**	**CO1**

	b.	The N-channel MOSFET has a threshold voltage of 0.4V. In the saturation region at one point ID=2.25uA when VGS=0.5V. What will be the value of ID if VGS reaches to 0.7 V while operated in saturation region	**10 Marks**	**L31**	**CO**
		Or			
7.	**a.**	"Channel length" refers to the effective length of the conductive path in a MOSFET (Metal-Oxide-Semiconductor Field-Effect Transistor), which is the distance between the source and drain electrodes. Describe channel modulation with neat diagram and derive the relevant expression for the drain current.	**10 Marks**	**L2**	**CO1**
	b.	A MOSFET is biased at a drain current of 0.5 mA. If μCox = 100 μA/V2 , W=L = 10, and λ = 0.1 V^-1, calculate its small-signal parameters (gm & ro).	**10 Marks**	**L2**	**CO1**

8.	**a.**	(i) For the given circuit, if the threshold voltage of each transistor is 0.3V, then what is the output voltage at node Y.  (ii) An NMOS inverter is a basic digital logic circuit that uses only N-channel MOSFETs (NMOS transistors) to perform a logical inversion. Discuss nmos inverter with passive Load and draw the VTC of nmos inverter.	**10 Marks**	**L3**	**CO2**
	b.	MOSFETs are electronic devices used to switch or amplify voltages in circuits. Discuss MOS as a switch, as a diode and as a resistor.	**10 Marks**	**L2**	**CO3**
		Or			
9.	**a.**	(i) Find the voltage at P, Q, R in the given below circuit. Assume threshold voltage is 1V.  	**10 Marks**	**L3**	**CO2**

		(ii) The main advantage of using MOSFET as load device is that the silicon area occupied by the transistor is smaller than the area occupied by the resistive load. Explain nmos inverter circuit with active loads (Enhancement & Depletion).			
	b.	Current Mirrors are particularly useful in the integrated circuits, for biasing the amplifiers. Discuss mosfet current mirror circuit.	**10 Marks**	**L2**	**CO3**