JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech- VI Semester (ECE)

COURSE CODE (CREDITS): 18B11EC612 (4) MAX. MARKS: 15

COURSE NAME: VLSI TECHNOLOGY

COURSE INSTRUCTORS: Dr. Shruti Jain MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No.	Question	CO	Marks
Q1	i. A MOSFET in saturation has a drain current of 1mA for V_{DS} = 0.5 V. If the channel length modulation coefficient is 0.5V^{-1} the output resistance (in the kΩ) of the MOSFET is_____. ii. Tell Sita when the gate to source voltages is negative. iii. The expression for threshold voltage for the enhancement mode *n*-MOS is_____. iv. Drain and gate terminal of *n*- channel MOSFET are connected together. Voltage V_i is applied on drain terminal. For this configuration, give the voltage current relationship. v. The Fermi potential for depletion mode *p*-substrate is _____	[CO 1]	5
Q2	i. An nMOS transistor, operating in the linear resistance region with V_{DS} = 0.1V, is found to conduct 60μA for V_{GS} = 2V and 160μA for V_{GS} = 4V. What is the apparent value of threshold voltage V_{th}? If k_n` = 50μA/V^2, what is the device W/L ratio? If the device is operated at V_{GS} = 3V, at what value of V_{DS}, will the drain end of the MOSFET channel just reach pinch off. ii. Explain different regions (using energy band) when MOS system works under external bias for an *n*-channel MOS transistor.	[CO 2]	3 + 2
Q3	i. An n-MOS transistor is fabricated with the following physical parameters $N_D = 10^{20}$ cm^{-3}, N_A(substrate) = $10^{16}cm^{-3}$, W = 10μm, Y = 5μm, L = 1.5μm, x_j = 0.4μm, reverse bias voltage = 2.5V, C_{jo} = 2.98 × 10^{-8} F/cm^2, φ_0 = 0.94V. Find source diffusion capacitance and drain diffusion capacitance for linearly graded junction. Assume that there is no channel implant. ii. In a technology for which the gate oxide thickness is 20nm, find the value of N_A, for which $\gamma = 0.5V^{1/2}$. (b) If the doping level is maintained but the gate oxide thickness is increased to 100nm, what does γ become?	[CO 1]	2 + 3