

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- September 2016

M.Tech I Semester (ECE)

COURSE CODE: 10M11EC114

MAX. MARKS: 15

COURSE NAME: VLSI CIRCUIT AND SYSTEM DESIGN

COURSE CREDITS: 04

MAX. TIME: 1Hr

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. Consider an enhancement MOS system with the following parameters : $t_{ox} = 200\text{\AA}$, $\phi_{GC} = -0.85\text{V}$, $N_A = 2 \cdot 10^{15}/\text{cm}^3$, $Q_{ox} = 2q \cdot 10^{11} \text{C}/\text{cm}^2$. [3 + 2 = 5]
 - a) Determine the threshold voltage V_{T0} under zero bias at room temperature.
 - b) Determine the type (p type or n type) and amount of channel implant ($/\text{cm}^2$) required to change the threshold voltage to 0.8V .
2. a) A n - MOS transistor with $V_A = 100 \text{V}/\mu\text{m}$ is operated at a dc current $I_D = 1 \text{mA}$. If the channel length is doubled and V_{GS} is fixed, find the new values of λ , V_A , I_D , and r_o . [0.5 × 4 = 2]
 - b) A p - MOS transistor has $k_p(W/L) = 80\mu\text{A}/\text{V}^2$, $V_{th} = -1.5\text{V}$, and $\lambda = -0.02\text{V}^{-1}$. The gate is connected to ground and the source to $+5\text{V}$. Find the drain current for $V_D = +1.5\text{V}$. Also find the effect of both scalings on the drain current if scaling factor is 2. [1 + 1 + 1 = 3]
3. The process parameters are: $N_D = 2 \times 10^{30} \text{cm}^{-3}$, $N_A = 1 \times 10^{15} \text{cm}^{-3}$, $x_j = 0.5 \mu\text{m}$, $W = 10 \mu\text{m}$, $Y = 6 \mu\text{m}$, $t_{ox} = 0.05 \mu\text{m}$, $V_{T0} = 0.8\text{V}$, channel stop doping = $16 \times$ (p- type substrate doping). Find the effective drain parasitic capacitance when the drain node voltage changes from 5V to 2.5V . [5]