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TEST-1 EXAMINATION- FEBRUARY -2018

B.Tech VI Semester (ECE)

COURSE CODE: 10B11EC612 MAX. MARKS: 15
COURSE NAME: VLSI TECHNOLOGY AND APPLICATIONS
COURSE CREDITS: 04 MAX. TIME: 1 HRS

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

1.

(a) Draw the transfer characteristics for enhancement type *p*-MOSFET and drain characteristics for depletion type *n*-MOSFET.
(b) Drain terminal and gate terminal of an *n*- channel MOSFET are connected together. Voltage V_{in} is applied on gate terminal. For this configuration, give the current and voltage relation. Give the formulas for power dissipation per gate, output resistance (for saturation region) and transconductance (for linear region) with units.
(c) A *p*-channel transistor operated in saturation with its source voltage 3V lower than its substrate. For $\gamma = 0.5V^{1/2}$, $2\varphi_f = 0.6V$, and $V_{to} = -0.7V$. Find threshold voltage?

[1 + 2 + 2 = 5]

2.

(a) Derive the expression for depletion region depth.
(b) Consider following parameters for *n*-channel enhancement MOSFET : gate oxide thickness = 100Å, aspect ratio= 4, electron mobility= 550 cm^2/ V.sec, V_{GS}= 1V, V_t= 0.6 V. Find values of Channel Resistance (R_{on}) for small V_{DS} and gate delay if scaled by 2 using full scaling method.
(c) Drain terminal and gate terminal of an *n*- channel MOSFET are connected together. Voltage V_B is applied on drain terminal. If V_B is 2V, process transconductance parameter is 20μA/V^2, aspect ratio is 2 and threshold voltage is 1V. Calculate dV_B / dI_D .

[1 + 2 + 2 = 5]

3. An *n*-MOS transistor is fabricated having $k_n' = 130\mu A/V^2$ and $V_A' = 20V/\mu m$ of channel length $L = 1.6\mu m$ and $W = 16\mu m$, find V_A and λ. Find the value of I_D that results when the device is operated with an overdrive voltage of 0.5V and $V_{DS} = 2V$. Also, find the value of r_o at this operating point. If V_{DS} is increased by 1V, what is the corresponding change in I_D? **[5]**