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National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch	**: ECE**	**Semester**	**: VIth**
Title of the Course	**: Basic of VLSI**	**Course Code**	**: ECB 351**
Time	**: 2 Hours**	**Maximum Marks**	**: 25**

Note: All questions are compulsory.

1. What is the threshold voltage of MOS transistor? Derive the expression for PMOS. 3

2. Derive the expression of drain current I_d for an NMOS transistor in saturation region. 3

3. Calculate the power dissipation in CMOS inverter if C_{load} = 2pF and VDD = 5V and the switching frequency of the inverter is 100KHz. 2

4. Discuss the operation of enhancement mode NMOS transistor with suitable diagrams. 3

5. Derive the expressions for noise margins of CMOS inverter. 5

6. Briefly explain the following with suitable diagrams 3 x 2 = 6
   a. Body bias effect
   b. Short channel effect
   c. Latch-up effect

7. Design the circuit with p-channel MOSFET as shown in figure 1. to meet the below specification. 3
   K_p = 100 μA/V²,
   VTP = -0.4V,
   I_D = 100μA,
   V_{SD} = 3V,
   V_{RS} = 0.8V

Figure 1