Digital Electronics

USN | | | | | | | | | | |

12EC009

M.Tech. Degree Examination, June/July 2013
Advances in VLSI Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. What are MOS devices? Explain saturation, linear and cut-off regions using drain current equations for MOS devices. **(10 Marks)**
b. Compare CMOS and BiCMOS technologies. **(06 Marks)**
c. Discuss CMOS device aspect ratio. **(04 Marks)**

2 a. With neat diagram, explain how MESFET reaches pinch-off and saturation. **(10 Marks)**
b. Derive a drain current (ID) of JFET extended to MESFET using its quantitative description. **(10 Marks)**

3 a. Explain MIS system in equilibrium. **(06 Marks)**
b. Calculate the threshold voltage for realistic n-channel MIS system device, given the following: $N_a = 10^{17}cm^{-3}$, $Q_i = 10^{11}$ q/cm^2, d = 20nm, ψ_{ms} = -0.95V. **(08 Marks)**
c. Explain small signal model operation of MOSFET. **(06 Marks)**

4 a. Using mobility, transit time and drain current explain short channel effect. **(12 Marks)**
b. What is proximity effect? Explain processing challenges for CMOS miniaturization. **(08 Marks)**

5 a. Explain carbon nanotubes. **(08 Marks)**
b. Discuss molecular diode under forward bias and reverse bias. **(08 Marks)**
c. Write note on direct tolerant computing. **(04 Marks)**

6 a. With the help of long polysilicon line, derive an expression for propagation delay. **(10 Marks)**
b. Explain designing of pass transistor logic for NMOS, PMOS and CMOS. **(10 Marks)**

7 a. Realize 4-bit tree network using tally circuit and write its stick diagram. **(10 Marks)**
b. Realize the static AOI gates in NMOS and CMOS technology for the following: $Y = \overline{(AB + CD)}$. **(06 Marks)**
c. Explain chip architecture. **(04 Marks)**

8 Explain the following:
a. Regularity and modularity.
b. Programmable structure.
c. CMOS design method.
d. Full custom design. **(20 Marks)**

* * * * *

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.