

Time: 3 Hours

**FEBRUARY 2014**

Max. Marks: 100

*PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.*

NOTE:

- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

- Q.1**
- Explain short channel effect in MOSFET.
  - Describe molecular beam epitaxy method to grow crystal.
  - Explain photo- lithography process to fabricate circuit chips.
  - Estimate the number of gates that can be included on a logic – gate array chip which is to be assembled in a 100 I/O package. Assume  $\alpha = 4.5$  and  $\beta = 0.5$
  - Explain body effect in MOSFET.
  - Explain the effect of scaling on circuit parameters.
  - Explain two PN diode model of BJT. (7×4)
- Q.2**
- Explain VLSI design flow. (10)
  - Give the comparison between CMOS and bipolar technologies. (8)
- Q.3**
- What is diffusion? Explain models of diffusion in solids. (10)
  - What is the stored charge and number of electrons on an MOS capacitor with an area of  $4\mu\text{m}^2$  a dielectric of  $200\text{ \AA}$  thick  $\text{SiO}_2$  and applied voltage of 5V? (8)
- Q.4**
- How VHDL is used to model the digital. (10)
  - Give state transition table for Mealy machine. (8)
- Q.5**
- Draw the block diagram of a general two-stage op-amp and explain the working operation of each block. (10)
  - Draw the two stage CMOS OPAMP Configuration and calculate its voltage gain. (8)

- Q.6** a. Explain finite state machines. (10)
- b. Explain fault model in VLSI design. (8)
- Q.7** a. Explain the importance of scaling of MOS transistor dimensions. Explain the types of scaling and show the effects of parameters in constant voltage scaling. (12)
- b. List the characteristics of a system on a chip. (6)