

Thapar Institute of Engineering & Technology, Patiala

CA 002 (Elements of Electronics Engineering)

End Sem- Exam: December 15, 2006

Time: 3 hour

Maximum Marks: 72

- Attempt any four questions.
- The subparts of a question should be attempted in sequence.
- Evaluated answer sheets can be seen on December 18, 2006 at 2 pm in Room no. B210

Q.1

- Explain why energy levels in a crystal split up to form energy bands?
- Explain the Early effect and its consequences.
- Explain why BJTs are called bipolar devices while FETs are called unipolar devices.
- Find the concentration (densities) of holes and electrons in n-type silicon at 300°K, if conductivity is 300 S/cm. Also find these values for p type silicon. Given that for Silicon at 300°K, $n_i = 1.5 \times 10^{10}/\text{cm}^3$, $\mu_n = 1300 \text{cm}^2/\text{V-s}$ and $\mu_p = 500 \text{cm}^2/\text{V-s}$.

(4,4,4,6)

Q.2

- What are relative merits of an N- channel MOSFET and a P-channel MOSFET.
- What are limitations of an open loop operational amplifier configuration?
- A FET has a driven current of 4 mA. If $I_{DSS} = 8 \text{mA}$ and $V_{GS(\text{off})} = -6 \text{V}$. Find the values of V_{GS} and V_p .
- Explain the laboratory setup for obtaining the Common Collector configuration. Also, discuss the utility of this configuration, if any.

(4,4,4,6)

Q.3

- What are the desirable characteristics of the input stage of an operational amplifier? Explain.
- Draw the logic circuit of edge triggered JK flip-flop and explain its working.
- Some decoders have one or more enable inputs. What is the function of these enable inputs.
- An inverting amplifier exhibits a flat response up to 40 k Hz. The gain of amplifier is 10. What maximum peak to peak input signal can be applied without distorting the output? Given slew rate = 0.5 V/ μs .

(4,4,4,6)

Q.4

- What is shift register? Discuss its main characteristics.
- Design a logic circuit having three inputs A, B and C such that output is 1 when $A=0$ or whenever $B=C=1$.
- Simplify the expression using Karnaugh map $f(A,B,C,D) = \Sigma(1,5,7,8,9,10,11,14,15)$.
- Draw logic circuit for expression, $Y = [\bar{A}\bar{B}(C+BD) + \bar{A}\bar{B}]C$. Simplify the expression and draw logic circuit for the simplified expression.

(4,4,4,6)

Q.5

- What is a multiplexer tree? Why is it needed?
- Explain the function of control inputs and clock input in a flip flop.
- A 4 bit ripple counter has a count of 1001 at any instant. What will be the count after 23 pulses.
- Design an octal to binary encoder and explain what do you mean by a parity encoder.

(4,4,4,6)