

Code No: 07A3EC16

**Set No.1**

**II B.Tech. I Semester Regular Examinations, November -2008**  
**DIGITAL LOGIC DESIGN**  
**( Common to Computer Science & Engineering, Information Technology and**  
**Computer Science & Systems Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Convert the following number with indicated bases to decimal [4×2=8]
  - i.  $(1\ 0\ 1\ 1\ 1\ 1)_2 =$
  - ii.  $(A\ 3\ B)_{16} =$
  - iii.  $(2\ 3\ 7)_8 =$
  - iv.  $(4\ 3)_5 =$(b) Obtain the 1's and 2's complements of the following binary numbers [4×2=8]
  - i.  $1\ 1\ 1\ 0\ 1\ 0\ 1\ 0 =$
  - ii.  $0\ 1\ 1\ 1\ 1\ 1\ 1\ 0 =$
  - iii.  $1\ 0\ 0\ 0\ 0\ 0\ 0\ 0 =$
  - iv.  $0\ 0\ 0\ 0\ 0\ 0\ 0\ 0 =$
2. (a) Simplify the following Boolean expression to a minimum number of literals.
  - i.  $F = (B\ \overline{C} + \overline{A}\ D) (A\ \overline{B} + C\ \overline{D})$
  - ii.  $F = WYZ + XY + X\ \overline{Z} + YZ$(b) Express the following function in sum of minterms and product of maxterms.  
 $F(A, B, C, D) = \overline{B}\ D + \overline{A}\ D + BD$  [8+8]
3. Implement the following Boolean function with NAND gates  
 $F(x,y,z) = \Sigma(1,2,3,4,5,7)$ . [16]
4. Design a code converter that converts BCD to excess - 3 code. [16]
5. (a) Discuss in detail about sequential circuit.  
(b) Construct a JK flip-flop using a D flip-flop, a 2-to-1 multiplexer and inverter. [8+8]
6. (a) Design a serial Adder in shift registers.  
(b) Write a HDL behavioral description of shift register. [8+8]
7. (a) Explain about internal construction of  $4 \times 4$  RAM  
(b) Design a combinational circuit using a ROM. The circuit accepts a 3-bit number and generates an output binary number equal to the square of the input number. [8+8]
8. Explain about SR Latch with example. [16]

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1. (a) Convert the following numbers. [4×=8]
  - i.  $(53)_{10} = ( )_2$
  - ii.  $(231)_4 = ( )_{10}$
  - iii.  $(1\ 1\ 0\ 1\ 1\ 0\ 1)_2 = ( )_8$
  - iv.  $(4D.56)_{16} = ( )_2$
  
- (b) Add and subtract in binary [4×=8]
  - i. 1 1 1 1 and 1 0 1 0
  - ii. 1 1 0 1 1 0 and 1 1 1 0 1
  - iii. 1 0 0 1 0 0 and 1 0 1 1 0
  - iv. 1 1 0 1 0 0 1 and 1 1 0 1 1
  
2. (a) Implement the following Boolean function using AND, OR and inverter gates.  
 $F = xy + \bar{x}\bar{y} + \bar{y}z$ .
- (b) Using the rules of boolean algebra, simplify the expressions that follow to the fewest total number of literals. [8+8]
  - i.  $f = A\bar{B} + ABC + A\bar{C}D$
  - ii.  $f = B + AD + BC + [B + A(C + D)]^1$
  
3. Simplify the following Boolean function using four-variable map.  
 $F(w, x, y, z) = \Sigma(1, 3, 7, 11, 15) + d(0, 2, 5)$ . [16]
  
4. (a) Explain carry propagation in parallel adder with a neat diagram.  
 (b) What is a decoder? Construct a 4×16 decoder with two 3×8 decoders. [8+8]
  
5. A Sequential circuit with two D flip-flops A and B, two inputs x and y and one output z is specified by the following next-state and output equation. [16]  
 $A(t + 1) = \bar{x}y + xA$   
 $z = B$   
 $B(t + 1) = \bar{x}B + xA$

  - (a) Draw the logic diagram of the circuit.
  - (b) List the state table for the sequential circuit.
  - (c) Draw the corresponding state diagram.

  
6. (a) Write about the HDL behavioral description of a 4-bit shift register.

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- (b) Write about serial adder. [8+8]
7. Explain about error detection and correction with example. [16]
8. (a) Write a procedure for analysing an asynchronous sequential circuit with SR latch.
- (b) Explain in detail about debounce circuit. [8+8]

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**Set No.3**

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1. (a) Perform the following binary multiplication operations
  - i.  $100010 \times 001010 =$
  - ii.  $001100 \times 011001 =$
  - iii.  $000100 \times 010101 =$(b) Write the one's and two's complements of the following example.
  - i. 0011001
  - ii. 1110011
  - iii. 111111. [10+6]
  
2. (a) State and explain the Duality principle with example.  
(b) Given the Boolean function  
 $F = x\bar{y}z + \bar{x}yz + \bar{w}xy + w\bar{x}y + wxy$ 
  - i. Obtain the truth table of the function
  - ii. Draw the logic diagram using the original Boolean expression
  - iii. Simplify the function to a minimum number of literals using Boolean algebra. [6+10]
  
3. Find all the prime implicants for the following Boolean functions and determine which are essential.  
 $F(A, B, C, D) = \Sigma (0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$  [16]
  
4. (a) What is meant by encoder?  
(b) Design a 4 - input priority encoder. [4+12]
  
5. Write the HDL behavioural description of a
  - (a) D flip - flop
  - (b) F flip - flop. [8+8]
  
6. (a) Design a Serial Adder.  
(b) Write a HDL behavioural description of shift register. [8+8]
  
7. (a) Explain about internal construction of 4×4 RAM.

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- (b) Design a combinational circuit using a ROM. The circuit accepts a 3-bit number and generates an output binary numbers equal to the square of the input number. [8+8]
8. (a) Explain the difference between asynchronous and synchronous sequential circuits.
- (b) Write about Hazards in sequential circuits. [8+8]

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1. (a) Find the decimal equivalent of the following two's complement numbers.
  - i. 11111
  - ii. 10001
  - iii. 01010
  - iv. 10011
  - v. 10101(b) Explain about error Detecting code with example. [10+6]
2. (a) Simplify each of the following expressions
  - i.  $ABC\bar{D} + \bar{A}\bar{B}CD + C\bar{D}$
  - ii.  $(A + \bar{B})(\bar{A} + \bar{B} + D)(\bar{B} + C + \bar{D})$(b) Explain about positive and Negative logic in binary signals. [8+8]
3. Obtain
  - (a) Sum of product and
  - (b) Product of sum expressions for the function given below  
 $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$  [16]
4. (a) Implement a Boolean function  
 $F(x, y, z) = \Sigma(2, 4, 6)$  with a Multiplexer.  
(b) Explain about Tri - State gates in digital systems. [8+8]
5. Design a sequential circuit with two JK flip - flops A,B with one input X and one out put Y.  
 $A(t + 1) = Ax + Bx$   
 $B(t + 1) = \bar{A}x$   
 $Y = A\bar{x} + B\bar{x}$ . [16]
6. (a) Design a serial Adder using shift register.  
(b) Write a HDL behavioral description of shift register. [8+8]
7. (a) Explain about internal construction of 4×4 RAM with neat diagram.  
(b) Design a combinational circuit using a ROM. The circuit accepts a 3- bit number and generates an output binary number equal to the square of the input number. [8+8]

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8. (a) Explain the difference between asynchronous and synchronous circuit.
- (b) Define fundamental - mode operation.
- (c) Explain the difference between stable and unstable states.
- (d) What is the difference between an internal state and a total state.[4+4+4+4]

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