Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Computer Engineering/Information Technology
Assignment (Data and File Structures- CE1006)

Unit-1 Number System

1. Convert following decimal number into binary.
    a. 365
    b. 0.8125
    c. 96.25
    d. 142
2. Convert following decimal number to octal number.
    a. 214
    b. 0.45
    c. 49.375
    d. 565
3. Convert following binary to decimal number
    a. 11011.101
    b. 10100.011
    c. 110111.101
4. Convert following octal number to decimal numbers
    a. 257.16
    b. 121
5. Convert following hexadecimal number into binary numbers
    a. 9AF.26
    b. 3FD
6. Perform Binary Multiplication of following numbers
    a. 1001x 10
    b. 1110x011
    c. 1001 x 10
7. Perform Binary Addition of following numbers
    a. 10101101 + 00011101
    b. 10110101+01110111
    c. 10111+11001
8. Perform Binary Subtraction of following numbers
    a. 10100111-01110100
    b. 10110-11011
    c. 11100-11001
9. Find 1's Complement of following numbers
    a. $(100110101)_2$
    b. $(1001010101)_2$
    c. $(1011110010)_2$
10. Find 2's complement of following numbers
    a. $(01101001)_2$

    b. $(10110101)_2$
    c. $(11101011)_2$
11. Convert following binary number to octal number
    a. 11010111.10101
    b. 10111101.11011
12. Perform Binary Division of following numbers
    a. 110÷10
    b. 1100÷100
    c. 110110÷101
13. Find 9's Complement for following numbers
    a. $(198)_{10}$
    b. $(2153)_{10}$
    c. $(6706)_{10}$
14. Find 10's complement of following numbers
    a. $(454)_{10}$
    b. $(247)_{10}$
    c. $(1634)_{10}$
15. Explain the conversion of binary code to Gray code and Gray code to binary code.
16. Enlist arithmetical operations of binary numbers. Explain any two of them with proper example.
17. Explain the conversion of Hexadecimal number system to Octal Number system.
18. What is Excess-3 Code? Write Excess-3 code for decimal number system.
19. Convert following number into gray to binary.
    a. 01110100
    b. 11010011
20. Convert following number into binary to gray.
    a. 01110010
    b. 11110011
21. Explain binary number system with proper examples.

Unit-II Boolean algebra and Logic Gates

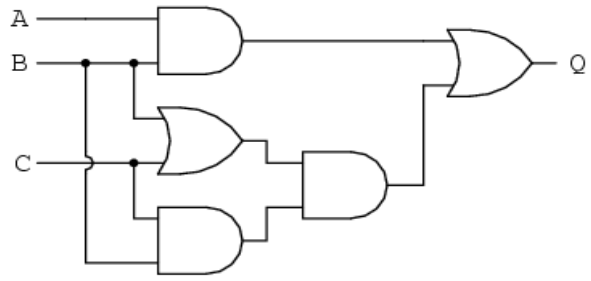
1. What is Logic gate? State different logic gate and explain any one in brief.
2. Draw symbol and write truth tables for all logic gates.
    a. AND gate
    b. OR gate
    c. NOT gate
    d. NAND gate
    e. NOR gate
    f. Ex-OR gate
3. Explain Ex-NOR gate with truth table in brief.
4. Prove that Bubbled OR gate is equivalent to NAND gate.
5. Prove that Bubbled AND gate is equivalent to NOR gate.

6. What is universal gate? Briefly explain gates being used as universal gates with truth table.
7. Draw the logic diagram and construct the truth table for each of following expressions.
    a. A+B+C
    b. AB+C
8. State and prove Duality principle of Boolean algebra.
9. State and prove De-Morgan's Theorem of Boolean algebra.
10. State and prove associative law of Boolean algebra.
11. State and prove distributive law of Boolean algebra.
12. State and prove absorption law of Boolean algebra.
13. State and prove commutative law of Boolean algebra.
14. Design following Boolean expression:
    a. AB+C
    b. (A+B)+D
15. Reduce following Boolean expression Using Boolean algebra.
    X'Y'+XY+X'Y
16. Define: 1. Sum of Product term 2. Product of Sum term
17. Sketch the following equation using basic gates.
    a. Y=(A+B)(A+C)
    b. Y=AB+AC
18. State limitation of K-map.
19. Define following terms:
    a. Minterm
    b. Maxterm
20. Explain Canonical form of SOP with an example.
21. Explain Canonical form of POS with an example.
22. Prove that NAND gate can be used as universal gate.
23. Prove that NOR can gate be used as universal gate.
24. What is Ex-NOR logic gate? Design Ex-NOR logic gate using NAND and NOR.
25. Reduce following Boolean expression Using Boolean algebra.
26. Reduce following Boolean expression Using Boolean algebra.
    Y= (B+BC) (B+B'C) (B+D)
27. Minimize following Boolean expression using K-map and realize it using basic gates.
    a. F(x,y,z)= $\sum(1,2,3,4,7)$
    b. F(x,y) = $\prod(1,3)$
28. Design following Boolean expression using logic gate:
    a. AB+A'B+AB'
    b. ABC+ABC'
29. Reduce following Boolean expression Using Boolean algebra.
    A[B+C'($\overline{AB + AC'}$)]

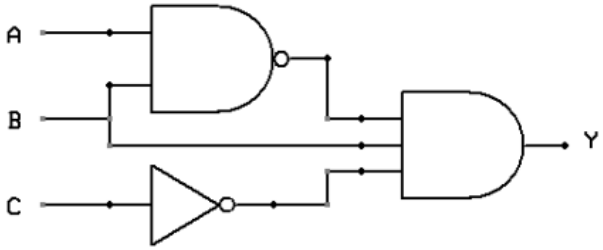
30. Minimize following Boolean expression using K-map and realize it using basic gates.
    a. Y=Σm(1,3,4,5,7,9,11,13,15)
    b. F=$\prod M(0,1,2,3,4,7)$
    c. Y=Σm(1,5,7,9,11,15)
    d. Y=$\prod M(1,5,6,7,8,9,10,14)$
31. Simplify the following Boolean expression using Don't care conditions in K-map and realize it using basic gates.
    a. Y= Σm (1,3,7,11,15) + d (0,2,5)
    b. Y= Σm (1,4,8,12,13,15) + d (3,14)

Unit-III Combinational Logic Design

1. Design following Boolean expression using basic gates:
    a. F = X + (YZ)
    b. F = (XY)' + (Y+Z')
2. Design and explain half adder with neat sketch.
3. Design and explain half subtractor with neat sketch.
4. Draw the following Boolean expression using basic gates:
    a. Y = (A+B)(A+C)
    b. Y = AB+AC
5. What is Multiplexer? Draw 2x1 multiplexer with neat sketch.
6. What is Demultiplexer?
7. Design 4x2 encoder with neat sketch and truth table.
8. Design 2x4 decoder with neat sketch and truth table.
9. Design 1 bit magnitude comparator in detail with neat sketch.
10. What is Comparator?
11. Define:
    a. Encoder
    b. Decoder
12. Draw the possible logic diagram for the following Boolean expression using basic gates.
    a. (AB)' + A + (B + C)'
    b. (A + AB) (B + BC) (C + AB)
13. Write the Boolean expression for the following given logic diagram.



14. Write the Boolean expression for the following given logic diagram.



15. Design and explain full adder with neat sketch.
16. Design and explain full subtractor with neat sketch.
17. Design and explain multiplexer with neat sketch. Design 4x1 multiplexer with select lines.
18. What is de-multiplexer? Design 1x4 de-multiplexer with truth table and select line. Implement the following function using 8x1 MUX.
    $F(a, b, c) = \Sigma m(0,2,3,5)$
19. Implement the following function using 16x1 MUX.
    $F(a, b, c) = \Sigma m(0,1,2,3,4,10,11,14,15)$
20. Implement the following multiple output combinational logic circuit using 1x8 DEMUX.
    a. $F1(a,b,c) = \Sigma m(1,2,4,7)$
    b. $F2(a,b,c) = \Sigma m(0,3,4,5)$
    c. $F3(a,b,c) = \Sigma m(3,6)$
21. Explain Encoder in detail. Design 8x3 encoder with neat sketch.
22. Explain decoder in detail. Design 3x8 decoder with neat sketch.
23. Give comparison between Multiplexer and De-multiplexer.
24. Discuss and design 2 bit magnitude comparator in detail with neat sketch.
25. Explain 4 bit binary to gray convertor in detail.
26. Explain 4 bit gray to binary convertor in detail.
27. Design of an Even parity bit generator for a 4 – bit input.
28. Design of an Odd parity bit generator for a 4 – bit input.

Unit-IV Sequential Circuit

1. Define: Register and Counter
2. Differentiate between flip-flop and latch.
3. What is Race around condition?
4. Design the following flip-flop and write its truth table.
    a. D flip-flop
    b. T flip-flop
    c. J-K flip-flop
    d. R-S flip-flop
5. What is counter? Give the classification of it.
6. Give difference between sequential and combinational circuits.
7. Draw and explain logical diagram of 4bit register in Serial in Serial out configuration (SISO).
8. Draw and explain logical diagram of 4bit register in Serial in parallel out configuration (SIPO).
9. Draw and explain logical diagram of 4bit register in Parallel in Serial out configuration (PISO).
10. Design and explain 4 bit series shift left register with appropriate example.
11. Design 3bit synchronous Up counter using T flip-flop.
12. Design 3bit synchronous Down counter using T flip-flop.
13. Design D flipflop using S-R Flipflop with necessary truth table.
14. Design T flipflop using J-K Flipflop with necessary truth table.
15. what is meant by asynchronous and synchronous counter? Give classification of it.

Unit-V Register Transfer Logic

1. What do you mean by micro operation? Enlist types of micro operation.
2. Define: inter-register transfer. Give one example of it.
3. Explain different arithmetic operations using registers.
4. Represent 12 and -12 using sign magnitude representation. Assume size of register = 8bits.
5. Draw the block diagram for the hardware that implements the following statement.
   T1:A←A+B
   T2:A←A+1
6. What are the disadvantages of fixed point representation?
7. Represent given number in floating point representation.
    a. 17.48
    b. 673.32
8. If R_1 = 0110 and R_2= 1100 then perform logical AND micro operation.

9. Which are three basic systems used to represent positive and negative number? Explain any two methods with suitable example.
10. Draw block diagram for the hardware that implementing the following statement.
    a. X+YZ: AR← AR+BR
    b. X+XY+XX'Z :AR←AR+1
11. Enlist different logical operations and explain any two micro operation with suitable example.
12. Enlist different Shift operations and explain any two micro operation with suitable example.
13. Explain function of overflow in detail.
14. What is micro operation? Explain any two operations in detail.
15. Explain Floating point representation of binary data in detail.

Unit-VI Analog to Digital and Digital to Analog Convertors

1. Draw basic block diagram of analog to digital converter.
2. Draw 3-bit resistor divider type digital to analog converter.
3. Explain basic principle of ADC.
4. Explain basic principle of DAC.
5. Draw circuit diagram of counter type ADC.
6. Draw circuit diagram of parallel comparator type ADC.
7. Draw circuit diagram of successive approximation type ADC.
8. Explain weighted register type DAC with the help of circuit diagram.
9. Explain counter type ADC with the help of circuit diagram.
10. Explain binary ladder type DAC with the help of circuit diagram.
11. Explain successive approximation type ADC with the help of circuit diagram.
12. Explain parallel comparator type ADC with the help of circuit diagram.
13. Explain resistor divider type DAC with the help of circuit diagram.
14. Draw and explain successive approximation type ADC in detail.
15. Explain basic working principle of DAC and ADC.
16. Draw and explain counter type ADC in detail.
17. Draw weighted resistor network type digital to analog converter network. Explain its working in detail.