



**SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR**  
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**QUESTION BANK (DESCRIPTIVE)**

**Subject with Code :** STLD(16EC402)

**Course & Branch:** B.Tech - ECE

**Year & Sem:** II-B.Tech & I-Sem

**UNIT –I**

**Binary Systems, Boolean Algebra & Logic gates**

1. Convert the given decimal number 234 to binary, quaternary, octal, hexadecimal and BCD equivalent. (10M)L1, CO.1
2. Perform the following
  - a) Subtraction by using 10's complement for the given 3456 - 245. (5M)L3, CO.1
  - b) Subtraction by using 2's complement for the given 111001-1010. (5M)L3, CO.1
3. a) Convert the following to Decimal and then to Octal. (i) 423416 (ii) 100100112. (5M)L1, CO.1  
 b) Convert the following to Decimal and then to Hexadecimal. ( i) 12348 (ii) 110011112 (5M)L1, CO.1
4. Simplify the following Boolean expression:
  - (a)  $F = (A+B)(A'+C)(B+C)$ . (5M)L3, CO.1
  - (b)  $F = A+B+C'+D(E+F)$  (5M)L3, CO.1
5. a) Obtain the truth table of the following Boolean function and express the function as sum of minterms and product of maxterms  $F = (A+B) (B+C)$  (5M)L3, CO.1  
 b) Simplify the following Boolean functions to minimum number of literals (5M)L3, CO.1
  - (i)  $xyz + x'y + xyz'$ . (ii)  $xz + x'yz$ .
6. Convert the following to Decimal and then to Octal (10M)L1, CO.1
  - (a)  $1234_{16}$  (b)  $12EF_{16}$  (c)  $10110011_2$  (d)  $10001111_2$  (e)  $352_{10}$
  - (f)  $999_{10}$
7. a) Simplify the following Boolean expressions to minimum no. of literals. (5M)L3, CO.1
  - i.  $ABC+A'B+ABC'$  ii.  $(BC'+A'D)(AB'+CD')$
  - iii.  $x'yz+xz$  iv.  $xy+x(wz+wz')$
 b) Obtain the Dual of the following Boolean expressions. (5M)L3, CO.1
  - i.  $AB+A(B+C)+B'(B+D)$  ii.  $A+B+A'B'C$
  - iii.  $A'B+A'BC'+A'BCD+A'BC'D'E$  iv.  $ABEF+ABE'F'+A'B'EF$
8. (a) State Duality theorem. List Boolean laws and their Duals. (5M)L1, CO.1  
 (b) Simplify the following Boolean functions to minimum number of literals: (5M)L3, CO.1
  - i.  $F = ABC + ABC' + A'B$  ii.  $F = (A+B)' (A'+B')$
9. a) Convert the following to binary and then to gray code. (5M)L1, CO.1
  - (i)  $(1111)_{16}$  (ii)  $(BC54)_{16}$  (iii)  $(237)_8$  (iv)  $(164)_{10}$  (v)  $(323)_8$
 b) Perform the following using BCD arithmetic (5M)L3, CO.1
  - (i)  $(79)_{10} + (177)_{10}$  (ii)  $(481)_{10} + (178)_{10}$
10. Convert the following to binary and then to gray code. (10M)L1, CO.1
  - (a)  $(1111)_{16}$  (b)  $(BC54)_{16}$  (c)  $(237)_8$  (d)  $(164)_{10}$  (e)  $(323)_8$

**UNIT –II****Gate -Level Minimization**

1. a) Minimize the following Boolean function using K-Map (5M)L2, CO.1  
 $F(A, B, C, D) = \sum m(0, 2, 4, 6, 8, 10, 12, 14)$   
 b) Realize it using NAND Gates. (5M)L2, CO.1
2. Minimize the given Boolean function  $F(A,B,C,D) = \sum m(0,1,2,3,6,7,13,15)$  using tabulation method and implement using basic gates (10M)L2, CO.1
3. a) Simplify the following Boolean expressions using K-map (5M)L3, CO.1  
 $F(W,X,Y,Z) = XZ + W'XY' + WXY + W'YZ + WY'Z$   
 b) Implement the same using NAND gates. (5M)L3, CO.1
4. Simplifying the following expression using tabulation technique. (10M)L3, CO.1  
 $F = \sum m(0,1,2,8,9,15,17,21,24,25,27,31)$
5. a) Simplify the following expression using the K-map for the 3-variable. (5M)L3, CO.1  
 $Y = AB'C + A'BC + A'B'C + A'B'C' + AB'C'$   
 b) Simplify the Boolean function  $F(A,B,C,D) = \sum(1,3,7,11,15) + d(0,2,5)$  (5M)L3, CO.1
6. a) Implement the following Boolean function using NOR gates. (5M)L3, CO.1  
 $Y = (AB' + A'B)(C + D')$   
 b) Simplify the following Boolean function for minimal POS form using K-map (5M)L3, CO.1  
 $F(X,Y,Z) = X'YZ + XY'Z' + XYZ + XYZ'$
7. Simplify the Boolean function by using tabulation method (10M)L3, CO.1  
 $F(a,b,c,d) = \sum m(0,1,2,5,6,7,8,9,10,14)$
8. Simplify the following Boolean function in POS form using K-map (10M)L3, CO.1  
 $F(A,B,C,D) = \sum(1,2,4,5,9,12,13,14)$
9. Simplify the following Boolean function using Tabulation method (10M)L3, CO.1  
 $Y(A,B,C,D) = \sum(1,3,5,8,9,11,15)$
10. a) Write the advantages of Tabulation method over K-Map method. (2M)L5, CO.1  
 b) Write the given Boolean expression  $f = A+B$  in Sum of minterms. (2M)L5, CO.1  
 c) SOP of  $F(x, y, z) = \sum(2, 3, 6, 7)$ . (2M)L3, CO.1  
 d) Implement OR gate using only two input NAND gates (2M)L3, CO.1  
 e) Implement the following Boolean equation using only NAND gates  $Y = AB + CDE + F$ . (2M)L3, CO.1

**UNIT –III****Combinational Logic**

1. a) Design & implement a 4-bit Binary-To-Gray code converter. (5M)L1, L3 CO.2  
 b) Design a 4 bit binary-to-BCD code converter (5M)L1, L3 CO.2
2. a) Design & implement BCD to Excess-3 code converter. (5M)L1, L3 CO.2  
 b) Design 32:1 Mux using two 16:1 Muxs and one 2:1 Mux. (5M)L1, L3 CO.2
3. a) Design & implement Full Adder with truth table. (5M)L1, L3 CO.2  
 b) Design & implement Full Subtractor with truth table. (5M)L1, L3 CO.2
4. Explain Carry Look Ahead Adder circuit with the help of logic diagram. (10M)L2, CO.2
5. Construct a BCD Adder-circuit. (10M)L2, CO.2
6. Implement 4-bit Magnitude Comparator and write down its design procedure. (10M)L3, CO.2
7. a) Design & implement Full Adder using Decoder. (4M)L1,L3 CO.2  
 b) Implement a 2-bit Magnitude comparator and write down its design procedure. (6M)L1,L3 CO.2
8. What is encoder? Design octal to binary encoder. (10M)L1, CO.2
9. a) Implement the following Boolean function using 8:1 multiplexer. (5M)L3, CO.2  

$$F(A,B,C,D) = A'BD' + ACD + B'CD + A'C'D.$$
 b) What is multiplexer? Construct 4\*1 multiplexer with logic gates and truth table (5M)L3, CO.2
10. a) Draw the basic structure of combinational logic circuit (2M)L3, CO.2  
 b) Design the full adder using half adders (2M)L1, CO.2  
 c) Implement 2-bit by 2-bit multiplier with half adders (2M)L3, CO.2  
 d) Realize a 2-bit comparator using gates (2M)L3, CO.2  
 e) What is priority encoder? Mention its operation (2M)L1, CO.2

**UNIT –IV****Synchronous Sequential Logic**

1. a) Design D Flip Flop by using SR Flip Flop and draw the timing diagram. (5M)L1, CO.2  
b) Write the differences between combinational and sequential circuits. (5M)L5, CO.2
2. a) Draw the logic symbol, characteristics table and derive characteristics equation of JK flip flop. (5M)L3, CO.2  
b) Design T Flip Flop by using JK Flip Flop and draw the timing diagram. (5M)L1, CO.2
3. a) Draw the circuit of JK flip flop using NAND gates and explain its operation. (5M)L3, CO.2  
b) Design a 2-input 2-output detector which produces an output 1 every time the sequence 0101 is detected. Implement the sequence detector using JK flip-flops. (5M)L1, CO.2
4. a) Convert S-R flip flop into JK-flip flop. Draw and explain the logic diagram. (5M)L1, CO.2  
b) A clocked sequential circuit with single input x and single output z produces an output z=1 whenever the input x compares the sequence 1011 and overlapping is allowed. Obtain the state diagram, state table and design the circuit with D flip-flops. (5M)L3, CO.2
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. (10M)L3, CO.2  

$$A(t+1) = x'y + xA, B(t+1) = x'B + xA \text{ and } Z = B$$
  - i) Draw the logic diagram of the circuit.
  - ii) List the state table and draw the corresponding state diagram
6. Design and implement 3-bit ripple counter using J-K flip flop. Draw the state diagram, logic diagram and timing diagram for the same. (10M)L1,L3, CO.2
7. With a neat sketch explain MOD 6 Johnson counter using D FF. IES 2015 (10M)L3, CO.2
8. Implement 6-bit ring counter using suitable shift register. Briefly describe its operation. (10M)L3, CO.2
9. Design a binary counter having repeated binary sequence using JK flip flops :0,1,2,4,5,6. (10M)L1, CO.2
10. a) Write the difference between Latch and Flip flop (2M)L5, CO.2  
b) List asynchronous inputs of a sequential device (2M)L1, CO.2  
c) Draw the block diagram of sequential circuit using combinational circuit and memory unit. (2M)L3, CO.2  
d) Draw the logic circuit of flip-flop and truth table using NOR gates. (2M)L3, CO.2  
e) Give the comparison between combinational circuits and sequential circuits. (2M)L1, CO.2

**UNIT –V****Finite State Machines & Programmable Memories**

1. Implement the following Boolean function using PLA **(10M)L3, CO.3**  
 (i)  $F(w,x,y,z) = \Sigma m(0,1,3,5,9,13)$       (ii)  $F(w,x,y,z) = \Sigma m(0,2,4,5,7,9,11,15)$
2. Implement the following Boolean function using PAL. **(10M)L3, CO.3**  
 (i)  $A(w,x,y,z) = \Sigma m(0,2,6,7,8,9,12,13)$     (ii)  $B(w,x,y,z) = \Sigma m(0,2,6,7,8,9,12,13,14)$   
 (iii)  $C(w,x,y,z) = \Sigma m(1,3,4,6,10,12,13)$     (iv)  $D(w,x,y,z) = \Sigma m(1,3,4,6,9,12,14)$
3. Implement the following Boolean function using PLA **(10M)L3, CO.3**  
 (i)  $F_1 = \Sigma m(0,1,2,3,8,10,12,14)$       (ii)  $F_2 = \Sigma m(0,1,2,3,4,6,8,10,12,14)$ .
4. Implement PLA circuit for the following functions  $F_1(A,B,C) = \Sigma m(3,5,6,7)$ ,  
 $F_2(A,B,C) = \Sigma m(0,2,4,7)$ . **(5M)L3, CO.3**
5. Discuss Mealy & Moore Machine models of sequential machines. **(10M)L1, CO.2**
6. Explain the minimization procedure for determining the set of equivalent state of a specified machine M. **(10M)L2, CO.2**
7. Explain the following related to sequential circuits with suitable examples.
  - a) State diagram **(2M)L1, CO.1**
  - b) State table **(2M)L1, CO.1**
  - c) State assignment **(6M)L1, CO.1**
8. a) Differentiate among ROM, PROM, DROM, EPROM, EEPROM, RAM. **(5M)L3, CO.3**  
 b) Explain about memory decoding. **(5M)L3, CO.3**
9. Given the 8-bit data word 01011011, generate the 12-bit composite word for the hamming code that corrects and detects single errors. **(10M)L3, CO.3**
10. Give the logic implementation of a 32x4 bit ROM using a decoder of a suitable figure. **(10M)L3, CO.3**