INSTITUTEOFAERONAUTICALENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500043

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Name	**DIGITAL LOGIC DESIGN**
Course Code	**A30401**
Class	II B. Tech I Sem
Branch	Computer Science Engineering
Year	2016– 17
Course Coordinator	Ms. C.Deepthi, Assistant Professor, ECE
Course Faculty	Mr. C.Srihari, Assistant Professor, ECE Ms. Parvathy Sreekumar, Assistant Professor, ECE Mr. R.Gangadhar Reddy, Assistant Professor, ECE

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I **DIGITAL SYSTEMS** **Part - A (Short Answer Questions)**		
1	**Write** short notes on binary number systems?	Understand	1
2	**Discuss** 1's and 2's complement methods of subtraction?	Understand	1
3	**Discuss** octal number system?	Understand	1
4	**State** and prove transposition theorem?	Knowledge	1
5	**Explain** how do you convert AOI logic to NAND logic?	Understand	2
	Write a short note on five bit BCD codes?	Understand	2

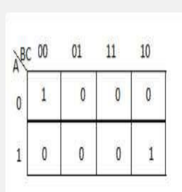
7	**Explain** the specialty of unit–distance code? State where they are used?	Understand	2
8	**Write** a short note on error correcting codes?	Understand	2
9	**State** and prove De-Morgan theorem?	Knowledge	3
10	**Discuss** what a logic design is and what do u mean by positive logic system?	Understand	2
11	**Convert** (4085)9 into base-5?	Understand	1
12	**Write** the first 20 decimal digits in base 3?	Understand	1
13	**Write** the steps involved in unsigned binary subtraction using complements with examples?	Understand	2
14	**Explain** the addition of two signed binary number along with examples?	Understand	2
15	**Differentiate** between binary code and BCD code?	Understand	3
16	**Explain** how binary values are stored in memory?	Understand	2
17	**Write** the Axiomatic Definitions of Boolean Algebra?	Understand	3
18	**Write** a table stating all the postulates and theorems of Boolean Algebra that are required for logic minimization?	Understand	3
19	**Convert** f(x)= x + y'z into canonical form?	Understand	3
20	**State** and prove idempotent laws of Boolean algebra?	Knowledge	3
	Part - B (Long Answer Questions)		
1	a) **Solve** the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend: i.100 – 110000 ii. 11010 - 1101. b) **Construct** a table for 4 -3 -2 -1 weighted code and write 9154 using this code .Write short notes on binary number systems.	Apply	2
2	a) **Solve** arithmetic operation indicated below. Follow signed bit notation: i. 001110 + 110010 ii. 101011 - 100110. b) **Explain** the importance of gray code?	Apply	1
3	**Solve** (3250 - 72532)10using 10's complement?	Apply	1
4	As part of an aircraft's functional monitoring system, a circuit is required to indicate the status of the landing gears prior to landing. Green LED display turns on if all three gears are properly extended	Understand	1

	when the \gear down" switch has been activated in preparation for landing. Red LED display turns on if any of the gears fail to extend properly prior to landing. When a landing gear is extended, its sensor produces a LOW voltage. When a landing gear is retracted, its sensor produces a HIGH voltage. **Design** a circuit to meet this requirement?		
5.	**Solve** (a) Divide 01100100 by 00011001 (b) Given that (292)10 =(1204)b determine `b'	Apply	1
6.	**Solve** (a) What is the gray code equivalent of the Hex Number 3A7 (b) Find the biquinary number code for the decimal numbers from 0 to 9 (c) Find 9's complement (25.639)10	Apply	1
7.	**Solve** (a) Find (72532 - 03250) using 9's complement. (b) Show the weights of three different 4 bit self complementing codes whose only negative weight is - 4 and write down number system from 0 to 9.	Apply	1
8.	Decimal system became popular because we have 10 fingers. A rich person On earth has decided to distribute Rs. one lakh equally to the following persons from various planets. **Find** out the amount each one of them will get in their respective currencies: A from planet VENUS possessing 8 fingers B from planet MARS possessing 6 fingers C from planet JUPITER possessing 14 fingers D from planet MOON possessing 16 fingers	Apply	1
9.	**State** and prove any 4 Boolean theorems with examples?	Knowledge	3
10.	**Solve** a) Simplify to a sum of 3 terms: A'C'D'+AC'+BCD+A'CD'+A'+AB'C' b) Given AB' + AB = C, Show that AC' + A'C = B	Apply	4
11	**Convert** 10101101.0111 to octal equivalent and hexadecimal equivalent?	Understand	1
12	**Apply** the representation of +65 and -65 in sign magnitude, Sign 1’s complement and sign 2’s complement representation?	Apply	1
13	**State** different ways for representing the signed binary numbers?	Knowledge	2
14	**Solve** addition and subtraction of (456)8 and (341)8?	Apply	1
15	**Define** weighted codes and non weighted codes with examples?	Knowledge	1

16	**Explain** what do you mean by error detecting and correcting codes?	Understand	3
17	**Illustrate** the rules for XS3 addition and subtraction?	Apply	2
18	**Explain** error occurred in the data transmission can be detected using parity bit?	Understand	3
19	**Illustrate** IEEE standard floating formats for 32-bit and 64 bit with following examples?	Apply	1
20	**Explain** the truth tables of X-OR, NAND and NOR gates?	Understand	2
	Part - C (Problem Solving and Critical Thinking Questions)		
1.	In a 32 bit computer, what are the maximum and minimum possible binary numbers? **Convert** these into maximum and minimum possible positive decimal numbers?	Understand	1
2.	**Convert** the octal numbers into binary,decimal,BCD and Hexadecimal numbers (3600)octal,(1200)octal,(0200)octal,(0777)octal.	Understand	1
3.	**Convert** the decimal numbers into binary, BCD and Hexadecimal numbers (3600)d, (1200)d, (0200)d, (0777)d.	Understand	1
4.	Suppose you have a cheque for RS.10000/-.what is the number system used? **Define** base system used and what are the weights of the digits 1,0,0,0 and 0 now?	Knowledge	1
5.	**Illustrate** why is (0.5252)octal twice of (0.2525)octal when (0.5050)d is twice of (0.2525)d.	Apply	1
6.	**write** the octal Representation of the following fractional numbers:(0.5)d,(1.5)d, (2.333)d,(3.875)d, (13.125)d, (14.666)d.	Understand	1
7.	**Find** the illegal Representation in the following: (120A)d, (1010011)BCD, (0208)octal, (10102011)b, (GC0A)h.	Understand	1
8.	**Convert** the binary number to hexadecimal number: 0100001011010011,010110101001111.	Understand	1
9.	**Convert** the hexadecimal number to binary number: 0x5A9F, 42D3.	Understand	1
10	**Understand** by two examples that two's compliment of a number taken twice returns the original number?	Understand	2

UNIT-II
GATE LEVEL MINIMIZATION AND COMBINATION CIRCUITS

Part - A (Short Answer Questions)

1	**Define** K-map? Name its advantages and disadvantages?	Knowledge	5
2	**Write** the block diagram of 2-4 and 3-8 decoders?	Understand	8
3	**Define** magnitude comparator?	Knowledge	5
4	**Describe** what do you mean by look-ahead carry?	Understand	5
5	**Summarize** the Boolean function $\mathbf{x'yz + x'yz' + xy'z' + xy'z}$ using K-map?	Understand	4
6	**Explain** how combinatorial circuits differ from sequential circuits?	Understand	5
7	**Explain** what are the IC components used to design combinatorial circuits with MSI and LSI?	Understand	5
8	**Design** the two graphic symbols for NAND gate?	Understand	6
9	**Design** the two graphic symbols for NOR gate?	Understand	6
10	**Summarize** the Boolean function $\mathbf{x'yz + x'yz' + xy'z' + xy'z}$ without using K- map?	Understand	4
11	**Explain** the properties of EX-OR gate?	Understand	6
12	**Solve** the function of fig with AND-OR INVRET implementations? 	Apply	4
13	**Solve** the following using NAND gates? a) (A+B)(C+D) b) A.B+CD(AB^{I}+CD)	Apply	4
14	**Sketch** the following equation using k-map and realize it using NAND gate? Y=∑m(4,5,8,9,11,12,13,15)	Apply	5
15	**Solve Y=$\mathbf{AB^{I}}$+CD+($\mathbf{A^{I}B+C^{I}D^{I}}$)** using NAND gate?	Apply	4
16	**State** that AND-OR network is equivalent to NAND-NAND network?	Knowledge	4

17	**Show** both NAND and NOR gates are called Universal gates?	Apply	4
18	**Sketch** the following logic function using k-map and implement it using logic gates? Y(A,B,C,D)= ∑m(0,1,2,3,4,7,8,9,10,11,12,14)	Apply	5
19	**Summarize** the rules and limitations of K-map simplification?	Understand	5
20	**Analyze** the steps for simplification of POS expression?	Apply	4
	Part - B (Long Answer Questions)		
1.	A combinational circuit has 4 inputs(A,B,C,D) and three outputs(X,Y,Z)XYZ represents a binary number whose value equals the number of 1's at the input i**state** the minterm expansion for the X,Y,Z ii. **state** the maxterm expansion for the Y and Z	Knowledge	3
2.	A combinational circuit has four inputs (A,B,C,D), which represent a binarycoded-decimal digit. The circuit has two groups of four outputs - S,T,U,V(MSB digit) and W,X,Y,Z.(LSB digit)Each group represents a BCD digit. The output digits represent a decimal number which is five times the input number. **Illustrate** the minimum expression for all the outputs?	Apply	3
3.	**Summarize** the following Boolean expressions using K-map and implement them using NOR gates: (a) F (A, B, C, D) = AB'C' + AC + A'CD' (b) F (W, X, Y, Z) = W'X'Y'Z' + WXY'Z' + W'X'YZ + WXYZ.	Understand	4
4.	**Design** BCD to Gray code converter and realize using logic gates?	Understand	4
5.	**Design EX-OR** using NAND gates?	Understand	4
6.	**compile** the following expression using Karnaugh map (B 'A + A'B + AB')	Understand	5
7.	**Design** a circuit with three inputs(A,B,C) and two outputs(X,Y) where the outputs are the binary count of the number of "ON" (HIGH) inputs?	Understand	4
8.	**Implement** the INVERTER gate, OR gate and AND gate using NAND gate, NOR gate?	Understand	3
9.	**Design** a circuit with four inputs and one output where the output is 1 if the input is divisible by 3 or 7?	Understand	4
10.	**Implement** the Boolean function F = AB + CD + E	Understand	3
11	**Implement** the Boolean function F = AB + CD + E using NAND gates only?	Understand	3
12	**Summarize** the Boolean function F(w, x, y, z) = Σ(1, 3, 7, 11, 15) + d(w, x, y, z) = Σ(0. 2, 5)	Understand	3
13	**Construct** the logic diagram of a full subtractor using only 2-input NAND gates?	Apply	3
14	**Construct** the logic diagram of a full subtractor using only 2-input NOR gates?	Apply	3

15	**Use** a multiplexer having three data select inputs to solve the logic for the function F = Σ (0, 1, 2, 3, 4, 10, 11, 14, 15)	Apply	4
16	**Identify** all the prime implicants and essential prime implicants of the following functions Using karnaugh map. F(A,B,C,D) = Σ(0,1,2,5,6,7,8,9,10,13,14,15).	Knowledge	5
	Part - C (Problem Solving and Critical Thinking Questions)		
1.	**Use** De-morgan theorem to simplify F=A+B+C.D.E.	Apply	3
2.	**State** that for constructing XOR from NANDs we need four NAND gates?	Knowledge	3
3.	**State** X+ (Y.Z) = (X+Y). (X+Z) = (X+Y).(X+Y+Z) a distributive law using De-Morgan theorem?	Knowledge	5
4.	**Convert** A.B.C+A.D expression into standard SOP format?	Understand	4
5.	**Convert** (A+B+C).(A+D) expression into standard POS format?	Understand	4
6.	**Construct** XOR from NOR gates?	Understand	3
7.	**Construct** SOP expression and POS expression for a four input NAND gate?	Understand	4
8.	**Understand** Excess-3 codes for 3 and 7?	Understand	3
9.	**Find** the logic function F using AND-OR two level realization?	Understand	4
10	**Find** transmitted 11 bits for 0110001 when hamming code is used?	Understand	4
UNIT-III COMBINATIONAL CIRCUITS			
	Part - A (Short Answer Questions)		
1	**Explain** the design procedure for combinational circuits?	Understand	7
2	**Apply** various code conversion methods?	Apply	7
3	**Design** a 4-bit binary to BCD converter?	Understand	7
4	**Design** and implement a 8421 Gray code converter?	Understand	7
5	**Design** a combinational logic circuit with 3 input variables that will produce logic 1 output when more than one input variables are logic 1?	Understand	7
6	**Compose** and explain the block diagram of 4-bit parallel adder?	Understand	7
7	**Design** a logic circuit to convert BCD and gray code?	Understand	7
8	**Design** a full adder using two half adders?	Understand	7
9	**Explain** magnitude comparator? Design a 3-bit comparator using logic gates?	Understand	7
10	**Compose** the circuit for 3 to 8 decoder and explain it with logic gate?	Understand	7

11	**Construct** the logic circuit for full subtractor using decoder?	Understand	7
12	**Define** binary decoder? Explain the working of 2:4 binary decoder?	Knowledge	7
13	**Design** Full adder using a suitable Decoder?	Apply	7
14	**Define** encoder? Design octal to binary encoder?	Knowledge	7
15	**Design** a 4-bit priority encoder?	Understand	7
16	**Design** the block diagram of a 4:1 multiplexer using 2:1 multiplexer?	Understand	7
17	**Summarize** the following Boolean function using 8:1 mux F(A,B,C,D)=πM(0,3,5,8,9,10,12,14)	Knowledge	7
18	**Explain** how decoder acts as a demultiplexer?	Understand	7
19	**Differentiate** multiplexer and demultiplexer?	Apply	7
20	**Explain** the working of 8:1 multiplexer?	Understand	7
	Part - B (Long Answer Questions)		
1.	**Design** a combinational circuit that generates the 9's complement of BCD digit?	Understand	7
2.	**Design** a combinational circuit to find the 2's complement of given binary number and realize using NAND gates?	Understand	7
3.	**Design** a logic circuit to convert gray code to binary code?	Understand	7
4.	**Design** circuit to detect invalid BCD number and implement using NAND gate only?	Understand	7
5.	**Explain** the design procedure for code converter with the help of example?	Understand	7
6.	**Construct** half subtractor using NAND gates?	Apply	7
7.	**Design** an 8-bit adder using two 74283?	Understand	7
8.	**Explain** the working of carry look-ahead generator?	Understand	10
9.	**Explain** carry propagation in parallel adder with neat diagram?	Understand	7
10.	**Explain** the circuit diagram of full subtractor and full adder?	Understand	7
11	**Construct** and explain the working of decimal adder?	Apply	7
12	**Design** 2-digit BCD adder with the help of binary adders?	Understand	7
13	**Design** Multiply 0112by 1102using binary multiplication method?	Understand	7

14	**Design** 4-bit comparator using logic gates?	Understand	7
15	**State** the procedure to implement Boolean function using decoder and also mention the uses of decoders?	Knowledge	7
16	**Design** and implement a full adder circuit using a 3:8 decoder?	Understand	7
17	**Describe** the operation performed by the following logic circuit with an example. Encoder?		7
18	**Design** and Implement full adder circuit using Quadruple 2 to 1 multiplexer?	Understand	7
19	**Construct** 16:1 multiplexer using 8:1 and 2:1 multiplexer?	Apply	7
20	**Construct** a full adder using a suitable multiplexer?	Apply	7
Part - C (Problem Solving and Critical Thinking Questions)			
1.	**Design** a combinational logic circuit that produces the product of 2 binary number ? A=(A1,A0)*B=(B2, B1, B0)	Understand	7
2.	**Solve** the function using multiplexer F(x,y,z)=∑(0,2,6,7)	Apply	7
3.	A combinational circuit has 4 inputs(A,B,C,D) and three outputs(X,Y,Z)XYZ represents a binary number whose value equals the number of 1's at the input: i. **Find** the minterm expansion for the X,Y,Z ii. **Find** the maxterm expansion for the Y and Z	Understand	7
4.	**Design** a combinational logic circuit with 4 inputs A, B, C, D. The output Y goes High if and only if A and C inputs go High. Draw the truth table. Minimize the Boolean function using K-map. Draw the circuit diagram?	Understand	7
5.	**Design** a logic circuit to convert excess-3 code to BCD code?	Understand	7
6.	**Design** a 24-bit group ripple adder using 74X283 ICs?	Understand	7
7.	**Design** a multiple circuit to multiply the following binary number A=A0A1A2 and B=B0B1B2B3 using required number of binary parallel adders?	Understand	7
8.	**Solve** the following Boolean functions using decoder and OR gates: F1(A,B,C,D)=∑(2,4,7,9) F2(A,B,C,D)=∑(10,13,14,15)	Apply	7
9.	**Design** the interfacing diagram of 10 key keypad interfaces to digital system using decimal to BCD encoder?	Understand	7
10	**Solve** the following Boolean function using 4:1 mux	Apply	7

	F(A,B,C,D)=∑m(1,3,5,7,8,9,0,2,10,12,13)		

UNIT-IV
SYNCHRONOUS SEQUENTIAL CIRCUITS

Part - A (Short Answer Questions)

1	**Differentiate** combinational and sequential logic circuits?	Apply	6
2	**Explain** basic difference between a shift register and counter?	Understand	6
3	**Illustrate** applications of shift registers?	Apply	6
4	**Define** bidirectional shift register?	Knowledge	6
5	**Describe** dynamic shift register?	Knowledge	6
6	**Convert** a JK Flip Flop to T	Understand	6
7	**Classify** the basic types of counters?	Understand	6
8	**Differentiate** the advantages and disadvantages of ripple counters?	Apply	6
9	**Convert** a JK Flip Flop to SR	Understand	6
10	**Explain** what is a variable modulus counter?	Understand	6
11	**Design** and explain gated latch logic diagram?	Understand	8
12	**Define** race around condition? How it can be avoided?	Knowledge	8
13	**Convert** a JK Flip Flop to D	Understand	6
14	**Convert** a SR Flip-Flop to JK	Understand	6
15	**Explain** what is a synchronous latch?	Understand	6
16	**Construct** a latch using universal gates?	Apply	8
17	**Explain** what do you mean a stable state?	Understand	8
18	**Define** a Flip-Flop?	Knowledge	6
19	**Define** applications of Flip-Flops?	Knowledge	6
20	**Explain** what is meant by clocked flip-flop?	Understand	6

Part - B (Long Answer Questions)

1.	**Explain** the design of Sequential circuit with an example. Show the state reduction, state assignment?	Understand	6
2.	**Write** short notes on shift register? Mention its application along with the Serial Transfer in 4-bit shift Registers?	Understand	6

3.	**Design** a 4-bit BCD Ripple Counter by using T-FF?	Understand	6
4.	**Define** BCD Down Counter and Draw its State table for BCD Counter?	Knowledge	6
5.	**Explain** the state reduction and state assignment in designing sequential circuit. Consider one example in the above process?	Understand	10
6.	**Design** a sequential circuit with two D flip-ops A and B. and one input x. when x=0,the state of the circuit remains the same. When x=1,the circuit goes through the state transition from 00 to 11 to 11 to 10 back to 00.and repeats?	Understand	6
7.	**Design** a Modulo-12 up Synchronous counter Using T-Flip Flops and draw the Circuit diagram?	Understand	6
8.	**Explain** the Ripple counter design. Also the decade counter design?	Understand	10
9.	**Design** a 3 bit ring counter? Discuss how ring counters differ from twisted ring counter?	Understand	6
10	**Design** a left shift and right shift for the following data 10110101?	Understand	6
11	**Design** Johnson counter and state its advantages and disadvantages?	Understand	6
12	**Explain** with the help of a block diagram, the basic components of a Sequential Circuit?	Understand	6
13	**Explain** about RS and JK flip-flops?	Understand	6
14	**Define** T–Flip-flop with the help of a logic diagram and characteristic table?	Knowledge	6
15	**Define** Latch. Explain about Different types of Latches in detail?	Knowledge	6
16	**Illustrate** pulse mode asynchronous circuit?	Apply	10
17	**List** the characteristic Tables and Equations for all Flip-Flops?	Knowledge	6
18	**Construct** the transition table for the following flip-flops i) SR FF ii) D FF	Apply	6
19	**Describe** the steps involved in design of asynchronous sequential circuit in detail with an example?	Understand	10
20	**Differentiate** critical and non critical race conditions?	Apply	10

Part - C (Problem Solving and Critical Thinking Questions)

1.	**Design** Universal Shift Register		Analyze	7

<table>
<tr><td>2.</td><td>A sequential circuit has 3 flip-flops, A,B and C and one input ,X .it is described by the following flip flop input functions?
$D_A=(BC^I+B^IC)x+(BC+B^I C^I)x^I$
$D_B=A$ $D_C=B$
i)Derive the state table for circuit
ii)Draw two state diagrams: One for x=0 and for x=1</td><td>Apply</td><td>6</td></tr>
<tr><td>3.</td><td>Design and implement 4-bit binary counter(using D flip flops) which counts all possible odd numbers only?</td><td>Understand</td><td>6</td></tr>
<tr><td>4.</td><td>Find the state assignments for sequence 1101011?</td><td>Understand</td><td>10</td></tr>
<tr><td>5.</td><td>State Table
<table>
<tr><td>Present State</td><td colspan="2">Next State</td><td colspan="2">Out Put</td></tr>
<tr><td></td><td>X=0</td><td>X=1</td><td>X=0</td><td>X=1</td></tr>
<tr><td>a</td><td>c</td><td>b</td><td>0</td><td>1</td></tr>
<tr><td>b</td><td>d</td><td>a</td><td>0</td><td>1</td></tr>
<tr><td>c</td><td>a</td><td>d</td><td>1</td><td>0</td></tr>
<tr><td>d</td><td>b</td><td>d</td><td>1</td><td>0</td></tr>
</table>
Reduce state and Flow table by using Implication Table.</td><td>Understand</td><td>10</td></tr>
<tr><td>6.</td><td>Design a MOD-5 synchronous counter using flip flops and implement it? Also draw the timing diagram?</td><td>Understand</td><td>6</td></tr>
<tr><td>7.</td><td>An Asynchronous Sequential Circuit that has two internal states and one output. The Excitation and output functions describing the circuits are
$Y_1= x_1x_2 + x_1y_2^1 + x_2^1y_1$ $Y_2 = x_2 + x_1y_1^1y_2 + x_1^1y_1$ $Z = x_2 + y_1$
a) Draw the logic diagram b)Derive the transition table and output map
c) Reduce the state table and Draw reduced State diagram</td><td>Analyze</td><td>7</td></tr>
<tr><td>8.</td><td>Design an asynchronous sequential circuit with two inputs X and Y and with one output Z. Whenever Y is 1, input X is transferred to Z. When Y is 0 , The output does not change for any change in X?</td><td>Understand</td><td>10</td></tr>
<tr><td>9.</td><td>Design a counter with the following repeated binary sequence : 0,1,2,4,6. Use D-FF</td><td>Understand</td><td>6</td></tr>
<tr><td>10</td><td>Design a T flip flop from logic gates?</td><td>Understand</td><td>6</td></tr>
<tr><td colspan="4">UNIT-V
MEMORY</td></tr>
<tr><td colspan="4">Part - A (Short Answer Questions)</td></tr>
<tr><td>1</td><td>Explain the block diagram of memory unit?</td><td>Understand</td><td>9</td></tr>
<tr><td>2</td><td>Explain in detail about RAM and types of RAM?</td><td>Understand</td><td>9</td></tr>
<tr><td>3</td><td>Illustrate the features of a ROM cell?</td><td>Apply</td><td>9</td></tr>
<tr><td>4</td><td>Explain in detail about ROM and types of ROM?</td><td>Understand</td><td>9</td></tr>
<tr><td>5</td><td>Explain coincident memory decoding?</td><td>Understand</td><td>9</td></tr>
</table>

6	**Describe** what is meant by memory expansion? Mention its limits?	Understand	9
7	**List** a note on magnetic tape?	Knowledge	9
8	**Explain** the configuration of PLD's?	Knowledge	9
9	**Explain** the block diagram of ROM?	Understand	9
10	**Define** Address and Data Bus?	Understand	9
Part - B (Long Answer Questions)			
1	**Explain** the internal construction of 4*4 RAM	Understand	9
2	**Draw** the Two-Dimensional Decoding Structure for a 1K Word Memory	Understand	9
3	Tabulate the truth table for an 8*4 ROM that implements the Boolean functions $A(x,y,z) = \Sigma m(1,2,4)$ $B(x,y,z) = \Sigma m(0,1,6,7)$ $C(x,y,z) = \Sigma m(2,6)$ $D(x,y,z) = \Sigma m(1,2,3,5,7)$ Considering now the ROM as a memory, Specify the memory contents at Addresses 1 and 4.	Analyze	7
4	Derive the Programmable Logic Array Programming Table for the combinational circuit that squares a 3-bit number. Minimize the number of Product Terms.	Analyze	7
5	**List** the differences between Read Only Memories?	Understand	9
6	Tabulate the truth table for an ROM that implements the Boolean functions $A(x,y,z) = \Sigma m(1,2,4,7)$ $B(x,y,z) = \Sigma m(0,1,3,5,6)$ $C(x,y,z) = \Sigma m(0,2,4,5,7)$ $D(x,y,z) = \Sigma m(3,5,6,7)$	Analyze	7
7	Design and Implement the following boolean functions using PAL with four inputs and 3-wide AND-OR structure .$F1(A,B,C,D)= \Sigma m(2,12,13)$, $F2(A,B,C,D)= \Sigma m(7,8,9,10,11,12,13,14,15)$, $F3(A,B,C,D)= \Sigma m(0,2,3,4,5,6,7,8,10,11,15)$, $F4(A,B,C,D)= \Sigma m(1,2,8,12,13)$.	Understand	9
8	**List** How many address bits are needed to operate a 2 K *8 ROM?	Knowledge	9
9	**Design** a BCD to Excess-3 code converter and implement using Suitable PLA?	Understand	9
10	**Distinguish** between SRAM and DRAM and draw static RAM cell?	Understand	9
11	**Explain** the read and write operation a RAM can perform?	Understand	9
12	**Sketch** the PLA program table for the four Boolean functions Minimize the number of product terms? $A(x,y,z)=\sum(0,1,3,5)$, $B(x,y,z)=\sum(2,6)$, $C(x,y,z)=\sum(1,2,3,5,7)$, $D(x,y,z)=\sum(0,1,6)$	Apply	9
13	**Sketch** a PLA circuit to implement the logic functions $f1=A^IBC+AB^IC+AC^I$ and $f2=A^IB^IC^I+BC$.	Apply	9
14	**Differentiate** PAL with PLA with following examples?	Understand	9
Part - C (Problem Solving and Critical Thinking Questions)			
1	**Solve** the following two Boolean functions using a PLA having 3-inputs,4 product terms and 2 outputs? $F1(A,B,C)=\sum(0,1,2,4)$, $F2(A,B,C)=\sum(0,5,6,7)$	Apply	9
2	**Solve** the following multi boolean function using 3- inputs 4 Product terms 2 outputs PLA PLD? $F1(a2, a1, a0)=\sum m(0,1,3,5)$, $F2(a2, a1, a0)=\sum m(3,5,7)$	Apply	9

3	**Design** and implement 3-bit binary to gray code converter using PLA?	Understand	9
4	**Design** a combinational circuit using PAL. The circuit accepts 3-bit number and generates an output binary number equal to square of input	Understand	9
5	**Design** and implement Full Adder using PAL?	Understand	9
6	Tabulate the truth table for an 8*4 ROM that implements the Boolean functions $A(x,y,z) = \Sigma m(1,2,3,4,5,7)$ $B(x,y,z) = \Sigma m(0,1,4,6,7)$ $C(x,y,z) = \Sigma m(2,6,7)$ Considering now the ROM as a memory, Specify the memory contents at Addresses 1 and 4.	Understand	9

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