

I B. Tech II Semester Regular/Supplementary Examinations, August- 2022**DIGITAL LOGIC DESIGN**

(CSE-CS&T, CSE-AI&ML, CSE-AI, CSE-DS, CSE-AI&DS, CSE-CS, CSE-IOT&CS INCL BCT, CSE-CS&BS, CSE-IOT, AI&DS, Cyber Security)

Time: 3 hours

Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

UNIT-I

- 1 a) Convert the following (9M)
- i) 110001.1010010 into hexadecimal
 - ii) $(AB)_{16} = ()_{10}$
 - iii) $(1234)_8 = ()_2$

- b) Explain the BCD, Excess 3, alphanumeric codes with examples. (5M)

Or

- 2 a) Represent the decimal number 4608 in (6M)
- i) BCD
 - ii) Excess-3 code.
- b) Perform $(-20)-(-10)$ in binary using the signed-2's complement and 1's complement. (8M)

UNIT-II

- 3 a) Simplify the Boolean expressions to minimum number of literals (7M)
- i) $A+B+A'B'C$
 - ii) $AB + A(B+C) + B'(B+D)$

- b) Simplify the Boolean expression using K-MAP (7M)
- $$F(A,B,C,D) = \pi(3,5,6,7,11,13,14,15) + d(9,10,12)$$

Or

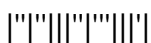
- 4 a) Reduce the expression $f(x,y,z,w) = \pi(0,2,7,8,9,10,11,15) + d(3,4)$ using K-Map. (7M)
- b) Prove that the sum of all minterms of Boolean function for three variables is 1. (7M)

UNIT-III

- 5 a) Design a binary full adder with two half adders and basic gates. (7M)
- b) Given 32×8 ROM with enable input, Show the external connections necessary to construct a 128×8 ROM with 4 chips and a decoder. (7M)

Or

- 6 a) Write the functions of a decoder and multiplexer. (7M)
- b) Write the HDL model of a 4:16 decoder. (7M)



UNIT-IV

- 7 a) Explain the Logic diagram of JK flip-flop? Draw the Truth table and Excitation Table. (7M)
b) Convert a D flip flop into SR flip flop. (7M)

Or

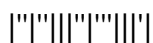
- 8 a) Write the differences between Combinational & Sequential circuits. (7M)
b) Convert a T flip flop to D flip flop. (7M)

UNIT-V

- 9 a) Explain synchronous and ripple counters compare their merits and demerits. (7M)
b) With neat sketch explain a 4-bit bidirectional shift register. (7M)

Or

- 10 a) Design a modulo -13 up synchronous counter using SR- flip flops and draw circuit diagram. (7M)
b) Explain a 4- bit left shift register with JK flip flops. (7M)



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UNIT-I

- 1 a) Convert the following numbers. (9M)
 i) $(423.25)_{10}$ into Hexadecimal.
 ii) $(11001101.0101)_2$ to base-8 and base-4
- b) Represent the decimal number 8620 in i) BCD ii) Excess-3 code. (5M)
- Or
- 2 a) Determine the value of base x if $(211)_x = (152)_8$. (5M)
 b) Perform binary subtraction using 1's & 2's complement methods. (9M)

UNIT-II

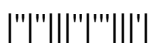
- 3 a) Implement the Boolean function $F(A,B,C,D) = A'B' + C'D' + B'C'$ using two input NAND gates and NOR gates only. (7M)
 b) Convert the following to canonical forms (7M)
 i) $F(x,y,z,w) = \sum(1,3,7,9,11,12)$ ii) $F(A,B,C) = \pi(0,3,6,7)$
- Or
- 4 a) Simplify the Boolean function using K-map method. (7M)
 $F = \sum(1,3,4,5,10,11,12,13,14,15)$.
- b) Derive and Implement Exclusive OR function involving three variables using only NAND function (7M)

UNIT-III

- 5 a) Construct the PROM using the conversion from BCD code to Excess-3 code. (7M)
 b) Implement 4x16 decoder using two 3x8 decoders. (7M)
- Or
- 6 a) Explain about Priority Encoder. (7M)
 b) Design PAL for a combinational circuit that squares a 3 bit number. (7M)

UNIT-IV

- 7 a) What is race-around condition? How does it eliminated in Master –slave J-K flip-flop? (7M)
 b) How do you convert one type of flip-flop into another? Explain with an Example. (7M)



Or

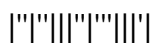
- 8 a) Write the differences between latches and flip flops? Write the truth table of clocked JK- Flip Flop? (7M)
- b) Realize D-latch using S-R latch. (7M)

UNIT-V

- 9 a) What is a register? What are the different classifications of Shift Registers? Discuss the applications of shift registers? (7M)
- b) Design and draw the 3 bit up-down synchronous counter? (7M)

Or

- 10 a) Draw the logic diagram for a 4-bit binary ripple counter using positive edge triggered JK flip-flops (7M)
- b) Explain a right shift register with an example. (7M)



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UNIT-I

- 1 a) What is the use of complements? Perform subtraction using 9's complement for (5M)
 the given numbers i. (565)-(666) ii. (763)-(567)
- b) Convert the following numbers (9M)
- $(41.6875)_{10} = ()_{16}$
 - $(4567)_{10} = ()_2$
 - $(101110.01)_2 = ()_8$

Or

- 2 a) Subtract the following using 1's and 2's complement $(101)_2 - (10110)_2$. (5M)
- b) Convert the following (9M)
- 110001.1010010 in to decimal.
 - Convert $(423.25)_{10}$ into Hex.
 - $(7A69)_{16}$ into decimal

UNIT-II

- 3 a) Obtain the simplified expression in SOP form of (7M)
 $F(a,b,c,d,e) = \sum(1,2,4,7,12,14,15,24,27,29,30,31)$ using K-maps.
- b) Simplify the following expression using Boolean algebra rules (7M)
- $$\overline{A\overline{B}} + ABC + A(B + A\overline{B})$$

Or

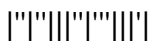
- 4 a) simplify the Boolean expression using K-MAP (7M)
 $F(A,B,C,D) = \sum m(1,2,3,8,9,10,11,14) + d(7,15)$
- b) Implement the function $f(a,b,c) = \pi(0,1,3,4)$ using NAND-NAND two level gate structure (7M)

UNIT-III

- 5 a) Design the combinational circuit of Binary to Excess-3 code convertors? (7M)
- b) Implement the following Boolean functions using PLA with 3 AND gates. (7M)
 $F_1(ABC) = \sum(3,5,7)$, $F_2 = \sum(4,5,7)$

Or

- 6 a) Discuss about HDL Models of Combinational Circuits (7M)
- b) Implement the following Boolean function using 8:1 multiplexer (7M)
 $F(A, B, C, D) = A'BD' + ACD + A'C'D + B'CD$

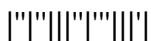


UNIT-IV

- 7 a) Define Flip-flop and various types of flip flops? Explain the working of S- R flip-flop Using NAND Gate. (7M)
- b) Convert an JK Flip-Flop into D Flip-Flop. (7M)
- Or
- 8 a) Draw and explain the operation of D Flip-Flop? Draw the Truth and Excitation Tables (7M)
- b) Convert an SR Flip-Flop into T Flip-Flop. (7M)

UNIT-V

- 9 a) What is the function of shift register? With the help of simple diagram explain its working. (7M)
- b) Design 4 bit binary synchronous counter Using JK-flip flop. (7M)
- Or
- 10 a) Design and explain Johnson counter. (7M)
- b) Explain the working of SIPO shift register with logic diagram and waveforms (7M)



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UNIT-I

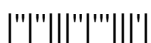
- 1 a) Convert the following (9M)
 i. $(BA69)_{16}$ to base 2, base 4, and base 8.
- b) Subtract $(111001)_2$ from (101011) using 1's complement? (5M)
- Or
- 2 a) Convert the following (7M)
 i) $(657)_8$ into decimal.
 ii) Convert $(2348)_{10}$ into hexa decimal
- b) Add $(+48)$ and (-27) using 2's complement. (7M)

UNIT-II

- 3 a) Simplify the Boolean expressions to minimum number of literals (7M)
 i) $AB + (AC)' + AB'C(AB + C)$
 ii) $(A+B)' (A'+B)'$
- b) Convert the given expression in standard POS and SOP forms $Y = A.(A+B+C)$ (7M)
- Or
- 4 a) Simplify the Boolean expression using K-map and implement using NOR gates (7M)
 $F(A,B,C,D) = \sum m(0,2,3,8,10,11,12,14)$.
- b) Obtain the simplified expression in sum of products for the following Boolean function. (7M)
 a) $F(A,B,C,D) = \sum(2,3,12,13,14,15)$.
 b) $BDE + B'C'D + CDE + A'B'CE + A'B'C + B'C'D'E'$

UNIT-III

- 5 a) Design a 4 bit magnitude comparator (7M)
- b) Implement the following functions using PLA. $A(x,y,z) = \sum m(1,2,4,6)$ $B(x,y,z) = \sum m(0,1,6,7)$ $c(x,y,z) = \sum m(2,6)$ (7M)
- Or
- 6 a) Design a 4 bit adder-subtractor circuit and explain the operation in detail. (7M)
- b) Define a multiplexer? Draw a 4:1 multiplexer for the function $f(a,b,c,d) = \sum(0, 4, 5, 10, 11, 12, 15)$ (7M)



UNIT-IV

- 7 a) Draw and explain the operation of T Flip-Flop? Draw the Truth and Excitation Tables. (7M)
- b) Convert an SR Flip-Flop into JK Flip-Flop. (7M)

Or

- 8 a) Explain about a NOR Latch in detail, with a neat diagram. (7M)
- b) Convert an T Flip-Flop into JK Flip-Flop. (7M)

UNIT-

- 9 a) Explain the design of a 4 bit binary counter with parallel load in detail? (7M)
- b) Explain about Ring counter. (7M)

Or

- 10 a) Design 5 -bit counter using D flip flops. (7M)
- b) With a neat diagram explain about Universal shift register. (7M)

