B.E. COMPUTER SCIENCE AND ENGINEERING

SECOND YEAR

FIRST SEMESTER EXAM 2024

Subject: **Digital Logic and Circuits**

Time : Three hours **Full Marks: 100**

CO-1 & CO-2 (25 marks)	1. Answer the following question: [2+3+5=10] a. Convert $(89)_{10}$ to BCD, binary, octal and hexadecimal. b. Generate Hamming code for the binary equivalent of $(89)_{10}$ using odd parity. c. Perform the following subtractions using 1's complement and 2's complement: (i) 101011 – 111001 (ii) 10110.01 – 11010.10 2. Answer the following questions: [2+3+4+3+3=15] a. What are the preconditions required to apply Consensus theorem? b. What is the utility of Shannon's Expansion theorem? Explain with an Example. c. Find out the prime implicants, essential prime implicants, and minimal expression of the following function F(W,X,Y,Z)= $\sum m(0,4,5,7,8,9,13,15) + \sum d(12,14)$ d. Express $F(X,Y,Z) = Y(\bar{X} + Z)$ to Canonical SOP. e. For function minimization, when will you prefer Quine McCluskey method over Karnaugh Map method and why?
CO-3 (60 marks)	**GROUP-A [Answer any two questions from this group.]** 1. a. Implement the Function F=$\sum m(1,2,4,5,10,12,12,13,14,15)$ using a 2 level AND –OR circuit. [4] b. Draw the circuit diagram in block level to compare one 6-bit number with another 5 bit number using 7485 [5] c. Detect the static hazards in the following function. Draw the hazard free circuit also. [6] F=$\sum(5,7,8,9,10,11,13,15)$ 2. a. Implement the Function F(D,C,B,A)= $\bar{C}\bar{B}A + D\bar{C}\bar{A} + D\bar{A}$ using one 4 to 1 MUX and other assorted gates. [5] b. Draw the circuit diagram of 3 to 8 Decoder. [5] c. Design the circuit Diagram of Carry Look ahead Generator. [5] 3. a. Implement the Function F=$\bar{W}\bar{X}Y + \bar{W}YZ + W\bar{Y}Z + W\bar{X}\bar{Y}$ using all NAND gates. [5] b. Design a 7 bit parity checker using 74180. How could this circuit be used to generate Odd or Even parity. Show the states of $\sum Even$ and $\sum Odd$ outputs for the incoming word 11001101 [6] c. What are the benefits of using priority Encoder over traditional Encoder, explain an example. [4] **GROUP-B [Answer any two questions from this group.]** 4. a. Draw a 4-bit Parallel-in / Serial-out Shift Register. [5] b. What is a Ring Counter? Draw a circuit for a 4-bit ring counter using D flip flop. Draw its timing diagram. [2+4+4=10] 5. a. What is a ripple counter? [2] b. Design a modulo-5 asynchronous up-counter using J-K flip flop. Draw the timing diagram. [10+3=13] 6. a. What are the differences between a Mealy machine and a Moore machine? [2] b. Design a Mealy machine that detects the sequence 0010 and implement the circuit using D flip-flops and logic gates. The sequence may be overlapping. [3+10=13]

CO-4 & 5 (15 marks)	Answer any one question. 7. a. Draw the functional diagram of monostable multivibrator using IC 555 timer and explain their operation. b. Draw and explain the operation of 4 bit successive approximation analog to digital converter. [5+5+5=15] 8. a. With a neat diagram explain a Binary weighted resistor (1010) configuration for digital to analog conversion. b. Using ECL implement Y= (A+B)' and explain it. c. Using TTL totem-pole output configuration implement Y= (AB)' and explain it. [5+5+5=15]