# Mid Semester Back Paper Examination, 2023

## (Old Syllabus)

**Name of the Course:B.Tech.** **Semester: III**

**Name of the Paper: Logic Design** **Paper Code:TCS-301**

**Time:1.5 Hours** **Maximum Marks: 50**

**Note: (i) All questions are compulsory**

**(ii) Answer any one sub question (a) OR (b)**

**(iii) Each sub question carries 10 marks**

| | | |
|---|---|---|
| Q1 | (10X1=10 Marks) | |
| (a) | (i) Convert the $(14)_{10} = (\ )_7$<br>(ii) Convert the octal number 57 to its binary representation.<br>(iii) Perform the addition of the hexadecimal numbers 14F and 29A.<br>(iv) Convert the decimal number 45 to its binary representation.<br>(v) What is the hexadecimal representation of the binary number 11010111? | CO1 |
| | OR | |
| (b) | (i) Minimize the following Boolean expression using a Karnaugh map:<br>$F = (A + B).(A + C).(A + D)$<br>(ii) Convert the given Boolean expression to its truth table and then use a Karnaugh map to find the simplified expression:<br>$F = AB + CD'$ | |
| **Q2** | (10X1=10 Marks) | |
| (a) | (i) Perform the subtraction of the binary numbers 10110 and 1001 using two's complement method.<br>(ii) Implement the given Boolean function using NAND gates only.<br>$F = AB + B'C + BC$ | CO2 |
| | OR | |
| (b) | Design a combinational circuit with three input x, y, and z and three outputs A, B and C. When the binary input is 0, 1, 2, or 3, the binary output is one greater than the input. When the binary input is 4, 5, 6, or 7, the binary output is one less than the input. | |
| Q3 | (10X1=10 Marks) | |
| (a) | Design and implement half adder and full adder using logic gates. | CO3 |
| | OR | |
| (b) | Design two bit magnitude comparator using logic gates. | |
| **Q4** | (10X1=10 Marks) | |
| (a) | Design the combinational circuit for 2-bit Binary to Gray code converter. | |
| | OR | CO3 |
| (b) | Design a 2 to 4 line decoder and draw its logic diagram. | |
| **Q5** | (10X1=10 Marks) | |
| (a) | Implement the expression using 4x1 multiplexer. Where c and d are control inputs<br>$F(a, b, c, d) = \sum(0, 2, 3, 6, 8, 9, 12, 14)$. | CO4 |
| | or | |

| | | |
|---|---|---|
| (b) | A combinational circuit is defined by the following three Boolean functions. Design the circuit with a decoder and external gates.<br>$F_1 = x'y'z' + xz$<br>$F_2 = xy'z' + x'y$<br>$F_3 = x'y'z + xy$ | |