## Switching Theory and Digital Design (CS 2300)

## DEPT. OF COMPUTER SCIENCE AND ENGINEERING Indian Institute of Technology Madras

## TUTORIAL 1 (Time allowed: 55 minutes)

## **NOTE:** Attempt **ALL** questions

1.	Convert the following numbers with the indicated bases to decimal: (a) $(4310)_5$ , (b) $(198)_{12}$ , (c) $(1 (26.24)_8)_8$	$(2 \text{ marks})^{16}$
2.	Convert $(1101)_2$ to BCD and $(00101001)_{BCD}$ to Binary.	(1  mark)
3.	Convert $(1001)_{BCD}$ to excess-3 and $(10011010)_{XS-3}$ to BCD.	(1  mark)
4.	Perform arithmetic operations in binary number system, (a) $(1001)_2 - (1000)_2$ , (b) $(0111)_2 \times (1101)_2$ , (c) $(101)_2$	$\begin{array}{c} (11001)_2 \div \\ (3 \text{ marks}) \end{array}$
5.	Convert the following numbers from one number system to the other directly,(a) $(12230)_4 \rightarrow (?)_7$ , (b) $(?)_6$ .	$(721)_8 \rightarrow (2 \text{ marks})$
6.	(a) Subtract $(1100)_2$ from $(1001)_2$ using 1's complement method.	(1  mark)
	(b) Subtract $(1010)_2$ from $(1001)_2$ using 2's complement method.	(1  mark)
7.	Convert the following binary numbers to hexadecimal and to decimal, (a) 1.11010, (b) 1110.10.	(2  marks)
-	Explain why the decimal answer in (b) is 8 times that of (a).	(1  mark)
8.	(a) Apply DeMorgan's theorem to each expressions, (i) $\overline{\overline{A+B}+\overline{C}}$ , (ii) $\overline{(\overline{A}+B)+CD}$	(2  marks)
	(b) Simplify the following Boolean expression $[A\bar{B}(C+BD) + \bar{A}\bar{B}]C$	(2  marks)
<b>9.</b> 1	Design ex-OR using minimum numbers of NAND gates.	(1  mark)
10.	Given the Boolean function $F = xy'z + x'y'z + w'xy + wx'y + wxy$	
	(a) Obtain the truth table of the function.	(2  marks)
	(b) Draw the logic diagram using the original Boolean expression.	(1  mark)
	(c) Simplify the function to a minimum number of literals using Boolean algebra.	(2  marks)
	(d) Draw the logic diagram from the simplified expression and compare the total number of gates with the part (b)	diagram of (1 mark)