2002 SCHEME

USN | | | | | | | | | | CS33

Third Semester B.E. Degree Examination, Dec 08 / Jan 09
Logic Design

Time: 3 hrs. Max. Marks:100

Note : *1. Answer any FIVE full questions.*
2. Any missing data may be suitably assumed.

1 a. Explain the principle of duality in Boolean algebra. Write the duals of the following Boolean expression : i) $AB + \bar{A}C + BC = AB + \bar{A}C$ ii) $\bar{x}z + xy = (\bar{x} + y)(x + z)$ iii) $a + b + \bar{a}\,\bar{b} = 1$. (08 Marks)

b. Prove the following using Boolean theorem.
i) $xy + yz + \bar{x}z = xy + \bar{x}z$ ii) $(x + y)(\bar{x} + z) = xz + \bar{x}y$. (06 Marks)

c. What are universal gates? Realize the basic gates using them. (06 Marks)

2 a. Obtain complement of the following Boolean function : (06 Marks)
i) $f(w, x, y, z) = \bar{w}xz + w(x + \bar{y}z)$ ii) $f(w, x, y, z) = (w + x + y)(\bar{w} + xz) + \bar{y}\,\bar{z}$

b. Using graphical procedure, obtain NAND gate realization of the following Boolean function. $f(w, x, y, z) = \bar{w}z + w\bar{z}(x + \bar{y})$. (08 Marks)

c. What is a map entered variable? Simplify the following function using MEV – K – map. (06 Marks)

W \ xy	00	01	11	10
0	$\bar{z}$	$\bar{z}$	$\bar{z}$	$\bar{z}$
1	$\bar{z}$	1	z	$\bar{z}$

3 a. Find minimal sum and minimal product of the following Boolean function.
$f(w, x, y, z) = \sum m(0, 1, 3, 7, 8, 12) + d\,c(5, 10, 13, 14)$. (10 Marks)

b. Using Quine Mc cluskey method, determine the prime applicants of the following function
$f(w, x, y, z) = \sum m(7, 9, 12, 13, 14, 15) + d\,c(4, 11)$. (10 Marks)

4 a. With the circuit diagram, explain the operation of the CMOS NAND gate. (08 Marks)

b. With the aid of a neat circuit diagram, explain the operation of a 2 – input TTL NAND gate. (08 Marks)

c. Compare TTL and CMOS logic families. (04 Marks)

5 a. With a neat block diagram, explain 4 – bit carry lookahead adder. (08 Marks)

b. Implement full subtractor using a decoder and 2 NAND gates. (06 Marks)

c. Realize the following function using 8 – to - 1 line multiplexes.
$f(w, x, y, z) = \sum m(0, 1, 5, 6, 7, 9, 12, 15)$. (06 Marks)

6 a. Using PROM, realize the following expressions.
$f_1(x_2, x_1, x_0) = \sum m(0, 1, 2, 5, 7)$, $f_2(x_2, x_1, x_0) = \sum m(1, 2, 4, 6)$ (08 Marks)

b. Distinguish between PLA and PAL. (04 Marks)

c. What is a register? With a neat logic diagram, explain universal shift register. (08 Marks)

7 a. Explain gated SR latch using NAND gate. (06 Marks)

b. Design a mod – 5 synchronous binary counter using JK flip – flop. (10 Marks)

c. Find out characteristic equations of S-R FF and J-k FF. (04 Marks)

8 Write short notes on the following :
a. 1 – bit comparator
b. Shannon's Expansion theorem
c. Single decode BCD adder
d. Mod – 8 twisted ring counter. (20 Marks)