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**Question Paper Code : 31480**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fourth Semester

Instrumentation and Control Engineering

IC 2251/IC 43/EC 1263 A/10133 IC 403/080260004 — DIGITAL PRINCIPLES AND DESIGN

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Simplify the following Boolean function using three variable maps.  
 $F = \Sigma m (1, 2, 3, 6, 7)$ .
2. Design a Half subtractor using 2-input NAND gate only.
3. Draw the circuit diagram for 4-bit Johnson Counter.
4. What do you mean by hazards?
5. Implement two input XOR gate using 2 to 1 multiplexer.
6. List out the special features for Field Programmable Gate array devices.
7. Make a Difference between the TTL and CMOS transistors.
8. Calculate the power dissipation of the standard TTL NAND gate for the given data.  $V_{cc} = 5v$ ,  $I_{cch} = 1 mA$ ,  $I_{ccl} = 3 mA$ .
9. List out the characteristics of NMOS transistors.
10. Draw the 2-input NOR gate using CMOS Transistors.

PART B — (5 × 16 = 80 marks)

11. (a) Use Quine McCluskey method to find a minimum cost SOP realization of the function  $f(x_1, x_2, x_3, x_4) = \Sigma m(2, 3, 5, 6, 7, 10, 11, 13, 14)$ . (16)

Or

- (b) (i) Show how the function  $f(w_1, w_2, w_3) = \Sigma m(0, 2, 3, 4, 5, 7)$  can be implemented using 3 to 8 binary encoder and OR gate. (8)
- (ii) Explain the operation of Full-Adder circuit with truth table and circuit diagram. (8)

12. (a) Design a sequential circuit with two flipflops A and B and two inputs E and F. If  $E = 0$ , the circuit remains the same regardless the value of F. When  $E = 1$  and  $F = 1$ , the circuit goes through the state transitions from 00 to 01, to 10, to 11, back to 00 and repeats. When  $E = 1$  and  $F = 0$  the circuit goes through the state transitions from 00 to 11, to 10, to 01, back to 00 and repeats. (16)

Or

- (b) Design a Mod-10 Up down counter using JK Flipflops. (16)

13. (a) Design a combinational circuit using a ROM. The circuit accepts a three bit number and outputs a binary number equal to the square of the number. (16)

Or

- (b) (i) Implement the following three Boolean functions with a PLA. (8)

(1)  $F_1(A, B, C) = \Sigma m(0, 1, 2, 4)$

(2)  $F_2(A, B, C) = \Sigma m(0, 5, 6, 7)$

(3)  $F_3(A, B, C) = \Sigma m(0, 3, 5, 7)$ .

- (ii) Draw a PLA circuit to implement the functions ; (8)

(1)  $F_1 = A'B + AC' + A'B'C'$

(2)  $F_2 = (AB + AB + BC)'$ .

14. (a) Detail description about the following terms :
- (i) Totem pole TTL NAND gate. (8)
  - (ii) I<sup>2</sup>L. (8)

Or

- (b) (i) Explain about the special characteristics of IC's with examples. (8)
  - (ii) How to interface TTL to CMOS and CMOS to TTL transistors with neat diagram? (8)
15. (a) Design a CMOS Full subtractor using AOI Logic. (16)

Or

- (b) Describe about the operations and Switching Characteristics of CMOS inverter circuit. (16)
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