SE/Sem III/CBGS/COMP/ DEC 16 /Digital logic Design & Analysis

Q.P. Code : 541000

16/12/16

(3 Hours) **[Total Marks : 80]**

N.B. 1) Question number 1 is compulsory.
2) Attempt any 3 questions from the remaining 5 questions.
3) Each question carries 20 marks.
4) Within a question, each sub-question carries equal marks.

1. a) Convert decimal number 151.33 into binary, base-4, octal, hexadecimal system.
b) A 7 bit even parity hamming code is received as 1000010. Correct it for any errors & extract 4 bit data.
c) Express the equation in standard SOP form: $F(A, B, C) = \prod M(0, 2, 5, 7)$.
d) Compare TTL & CMOS with respect to speed, power dissipation, fan-in & fan-out & also define these terms.
e) Draw JK flip-flop using SR flip-flop & additional gates. Explain briefly the race around condition in JK flip-flop.

2. a) Simplify the following equation using K-map to obtain minimum SOP equation & realize the minimum equation using two level NAND gates only.
$F(A, B, C, D) = \prod M(1, 3, 4, 6, 9, 11, 12, 14)$
b) What is Multiplexer? Implement the following function using 4:1 multiplexer and few gates.
$F(A, B, C, D) = \Sigma m(0, 1, 2, 3, 6, 7, 9, 10, 13, 15)$

3. a) Reduce using Quine McClusky method & realize the equation using only NAND gates.
$F(P, Q, R, S) = \Sigma m(0, 1, 2, 8, 10, 11, 14, 15)$
b) Prove using boolean algebra: "NAND gate is universal gate".

4 a) Develop the truth table for 2-bit binary multiplier & design it using a suitable decoder & additional gates.
b) Design MOD-7 synchronous up-counter. Show all the design steps.

(TURN OVER)

5. a) Develop the truth table of 3 bit binary to gray code converter and design it by using 3:8 decoder with active low outputs & additional gates.

   b) Draw a circuit diagram for MOD-10 asynchronous binary up counter using master-slave JK flip-flops. Show the output of each of the flip-flop with respect to the clock applied, write the state transition table and explain the operation in brief.

6. a) What is shift register? Draw a 4-bit universal shift register & explain PISO & SIPO operations.

   b) Draw & explain the working of 4-bit twisted ring counter with timing diagram.

****