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B.Tech. First Assessment – August 2017

Third Semester

Common to ECE ,EIE &CSE

15ECE202 Digital Circuits and Systems

Time: Two hours Maximum: 50 Marks

Answer all questions

PART-A 5*2=10

1. Convert $(378.93)_{10}$ to octal number system
2. State whether the following statements are True / False
   (i) An octet eliminates 2 variables
   (ii) An implicant is called a prime implicant if it cannot be combined into another implicant that has fewer literals.
3. Subtract 14 from 46 using the 8 bit 2's complement arithmetic.
4. Prove using Boolean algebra that (x+y) (y+z) (x+z) = xy + yz + xz
5. An elevator door should open if the elevator is stopped, it is level with the floor, and the timer has not expired or if the elevator is stopped, it is level with the floor and a button is pressed. Find the Boolean experiment for the statement.
   Use these variables for the Boolean expression. O: Elevator door open; S: Elevator stopped; F: Level with floor; T: Timer expired; B: Button pressed.

PART-B 4*10=40

1. Find the minimal product for the following Boolean expression using Quine McCluskey method
   $F = \Sigma\, m(1,3,4,5,10,12, 13, 15)$

2. (a) Find the minimal SOP for the function given below using K map.
   $F(A,B,C,D,E) = \Sigma m(0,1,2,4,5,8,14, 15, 16, 18, 20, 24, 26, 28,31) + \Sigma\, d(10,11,12,27)$ (8)

   (b) Find the base (b) of the system for $(16)_{10} = (100)_b$ (2)

3. (a) A lawn sprinkling system is controlled automatically by certain combination of the following variables
   Season (S=1 if summer; 0, otherwise) (5)
   Moisture content of soil (M=1, if high; 0, if low)
   Outside temperature (T=1, if high; 0, if low)
   Outside humidity (H=1, if high; 0, if low)

   The sprinkler is turned on under any of the following circumstances

(i) The moisture content is low in winter
(ii) The temperature is high and the moisture content is low in summer
(iii) The temperature is high and the humidity is high in summer
(iv) The temperature is low and the moisture content is low in summer
(v) The temperature is high and the humidity is low

Use a K map to the simplest possible logic expression involving the variables S,M,T and H for turning on the sprinkler system

(b) Design a 3 bit carry look ahead adder. (5)

4. (a) Consider the timing diagram shown in the Figure1 A and B are the inputs and Q is the output.

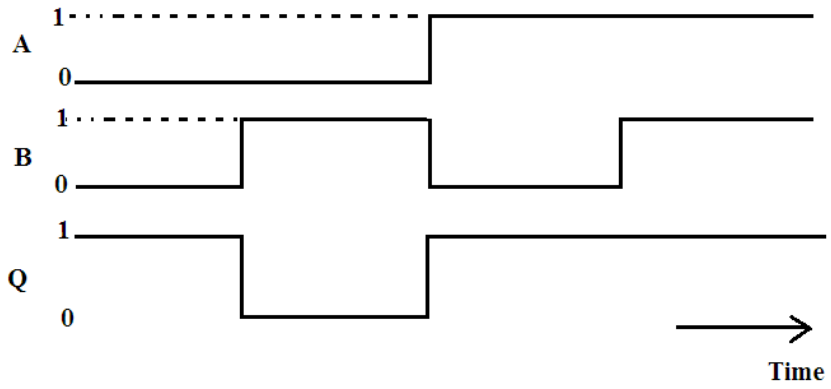

Figure .1

(i) Write a Boolean expression for Q as a function of A and B (2)

(ii) Using only NOR gates , design a circuit that implements the timing diagram. (2)

(b) Design a full adder circuit using only 2 input NAND gates (6)