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B.Tech. First Assessment – August 2016

Third Semester

15ECE202 Digital Circuits and Systems

(Common to Computer Science and Engineering, Electronics and Communication Engineering and Electronics and Instrumentation Engineering)

Time: Two hours   Maximum: 50 Marks

Answer all questions

1. (a) Express the decimal number 123 in hexadecimal form.   **(2)**

    (b) Determine the base of the system where the sum $23 + 56 = 112$ is valid.   **(4)**

    (c) Simplify the expression $F = \bar{A}BCD + \bar{A}\bar{C}D + B\bar{C}D + \bar{A}\bar{C}\bar{D}+\bar{A}B\bar{C}D$ without using K-map
                                                                                               (4)

2. (a) Data from a sensor is encoded in three bits $b_2b_1b_0$. When this three bit value exceeds 4, an alarm output *al* has to be asserted to logic 1. Write the truth table for the circuit and derive minimized Boolean expression for *al* using only Boolean identities (without using K-map)   **(3)**

    (b) Using Boolean identities convert the given SoPexpressioninto canonical form
    $F(A, B, C, D) = \bar{A} + B + CD$ **(3)**

    (c)Determine themaxtermsof the followingPoSexpression
    $F(A, B, C, D) = (\bar{A} + B + C)(C+\bar{D})$ **(4)**

3. A digital circuit has 3 inputs *A*, *B* and *C*. The waveforms shown below are applied to the inputs.The response in the output *y* is also plotted. Derive a minimized Boolean SoPexpression for *y* using a K-Map. Implement using only NAND gates   **(10)**
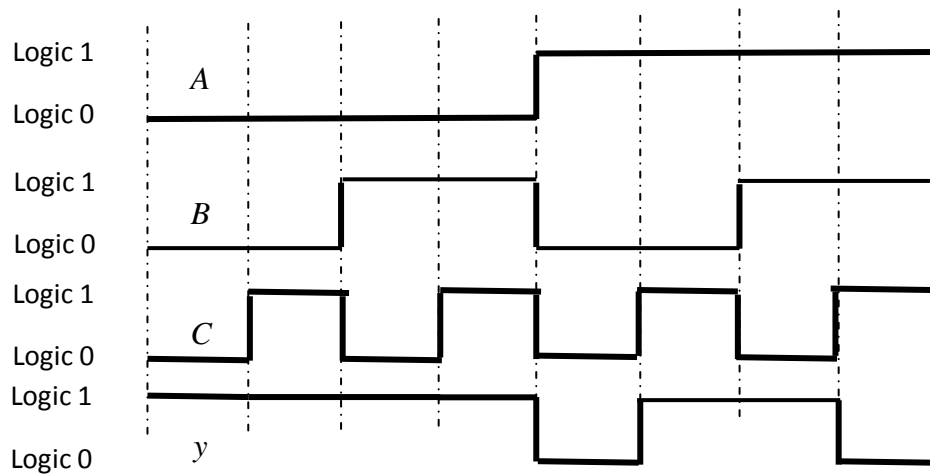
4. Obtain a minimized Boolean expression for the following truth table using tabulation method

(10)

$$F(A, B, C, D, E) = \sum m(3,5,7,9,11,15,17,19,21,23,25,27,29,31)$$

5. (a) Illustrate overflow with an example **(3)**

   (b) Represent the following numbers in 2s complement signed form (i) *-146* (ii) *+223* (iii) -*277*(iv)*+332* **(4)**

   (b) What is the word length of a twos complement adder/subtractor that can handle operands in the range *-150* to *+150* **(3)**

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