JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
MID SEMESTER (MARCH 2015)
B. Tech. 4th Semester (ECE)

COURSE CODE: 10B11EC401 MAX. MARKS: 30
COURSE NAME: DIGITAL ELECTRONICS MAX.TIME:2 HRS
COURSE CREDITS: 4

Note: All questions are compulsory. Attempt all questions of each section in one place.

Section - A (1x6=6)

A.1. Convert 5211 code (110001100011) to BCD.
A.2. Add the two BCD numbers 67+53.
A.3. Simplify the Boolean function $F = AB + CBA' + A$.
A.4. Express $(-39)_{10}$ as an 8 bit number in sign magnitude and 2's complement form.
A.5. Design a circuit to compare two one bit numbers.
A.6. Convert the following Maxterm expression to Minterm without reducing:

$$f = (A + C + D')(B' + C + D)(A')$$

Section B (3x3= 9)

B.1. Design a single combinational circuit to perform addition and subtraction of given two numbers A = 10101 and B = 00111.
B.2. Elaborate with the circuit diagram to achieve rectangular waveform of 50% duty cycle using IC 555.
B.3. A transmitted code word was received as 0010001 received. The receiver does not know what was transmitted and must look for proper parities to determine if the code is correct. Determine the error that has occurred in transmission if even parity is used.

Section C (3x5=15)

C.1. Design a combinational circuit using *both universal gates* with three inputs and one output.
   a. The output is 1 when the binary value of the inputs is less than or equal to 3. The output is 0 otherwise.
   b. The output is 1 when the binary value of the inputs is a prime number.

C.2. Using a decoder and external gates, design the combinational circuit defined by the following three Boolean function:

$$F1 = x'y'z' + xz + yz$$
$$F2 = xy'z' + x'y$$
$$F3 = x'y'z + xy$$

C.3. An 8 x 1 multiplexer has input $A, B, and\ C$ connected to the selection inputs $S_2, S_1, and\ S_0$, respectively. The data inputs I_0 through I_7 are as follows:

$$I_1 = I_2 = 0;\ I_3 = I_5 = I_7 = 1;\ Io = I_4 = D;\ and\ I_6 = D';$$

Design the above circuit using 2 x 1 multiplexer.

C.4. Given the function $T(W, X, Y, Z) = \sum(1, 3, 4, 5, 7, 8, 9, 11, 14, 15)$:
   a. Use the map to obtain the set of all prime implicants and indicate specifically the essential ones;
   b. find three distinct minimal expressions for T ;
   c. find the complement T' directly from the map.

C.5. Design code converter circuits which perform the BCD to XS-3 conversion.