

Computer Engineering Department
B.Tech. 2nd Year, Semester: 3rd
Digital Circuits
End Semester Exam- Dec. 2013

Time: 3 Hour

Max. Marks: 50

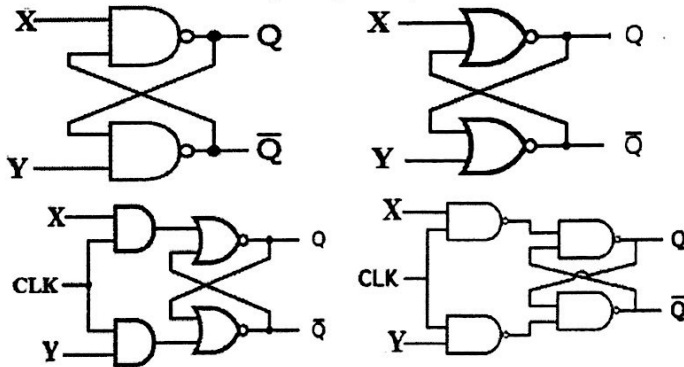
Note: All Questions are Compulsory.

Design the circuits neatly wherever required.

Sufficient data has been provided, if required assume by your side.

Q.1 A) For the given sequential circuits below. (4)

- Determine Set and Reset inputs. (from X and Y)
- Determine inputs X & Y for which outputs Q & Q-bar goes to indetermined state.
- Find value of outputs Q and Q-bar in indetermined state.



B) What is key debouncing? Explain how JK f/f can be used as denouncing circuit using proper waveforms. (4)

Q.2 A) Design synchronous self-starting counter that repeats binary sequence 1,2,4,6,1,2,4,6..... (5)

B) Design asynchronous modulo-13 down counter with self-starting facility using positive edge triggered RS flip flop having active high pre-set and clear asynchronous inputs. (4)

C) Explain how RS f/f can be used as Divide by 8 frequency divider? Design sequential circuit using flip-flops that will convert 90 Hz frequency clock pulse to 18 Hz. (4)

Q.3 Design shift register with parallel load that operates with following values of select lines (S1 & S2). (4)

S1	S2	OPERATION
0	0	SHIFT RIGHT
0	1	NO CHANGE
1	0	LOAD PARALLEL DATA
1	1	SHIFT LEFT

OR

Design digital clock which will show time in HH:MM:SS format. 2 digits for hours, 2 digits for minute and 2 digits for second. Also explain working of hour, minute and second section. Also explain how clock will be resettled from 23:59:59 to 00:00:00. (4)

Q.4 A) For chairs A, B, C and D are placed in a row. Give minterms and maxterms for the following: (2)

- F(A,B,C,D) is 1 if and only if there are no adjacent empty chairs.
- G(A,B,C,D) is 1 if and only if the chairs on the ends are both empty.
- H(A,B,C,D) is 1 if and only if at least three chairs are full.
- J(A,B,C,D) is 1 if and only if there are more people sitting in the right two chairs than in the left two chairs.

P.T.O

B) Find the truth table for BCD to seven segment decoder with active low output. Also simplify the expression for segments a, d, e, f. (3)

Q.5 A corporation having 100 shares entitles the owner of each share to cast one vote at the share-holder's meeting. Assume that A has 40 shares, B has 30 shares, C has 20 shares and D has 10 shares. A two-third majority is required to pass a resolution in a share-holders meeting. Each of these four men has a switch which he closes to vote YES and opens to vote NO for his percentage of shares. When the resolution is passed the output LED must be ON. Derive a truth table for the input function and give the sum of product equation for it. (5)

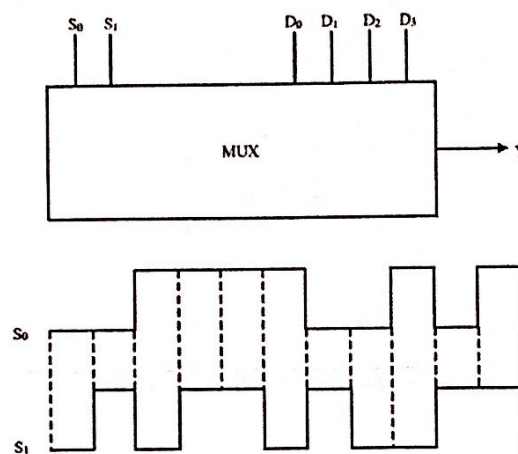
Q.6 A) Convert the following functions into canonical form: (3)

$$(A+B')(C'+D')(B'+C') \quad [\text{SOP \& POS}]$$

B) Reduce the given Boolean expression:

a) $\{[(ABC)'+(A'B)]'+BC\}$ b) $A[B+C(AB+AC)']$

C) If the data-select inputs to the multiplexer in the following figure are sequenced as shown by the waveforms, determine the output waveform with the following data inputs: $D_0 = 0$, $D_1 = 1$, $D_2 = 1$, $D_3 = 0$. (2)



Q.7 How 4-bit carry look-ahead adder is used to avoid propagation delay. Describe it in detail by using truth table, logical expressions and logic diagram. (5)

OR

Design a parallel binary multiplier that multiplies a 4 bit number $B = B_3 B_2 B_1 B_0$ by a 3 bit number $A = A_2 A_1 A_0$ to form a product $C = C_6 C_5 C_4 C_3 C_2 C_1 C_0$.

Q.8 A) Tabulate the truth table for a 8 X 4 ROM that implements the following Boolean functions: (5)

$$A(x, y, z) = \Sigma(1, 2, 4, 6), \quad B(x, y, z) = \Sigma(0, 1, 6, 7),$$

$$C(x, y, z) = \Sigma(2, 6), \quad D(x, y, z) = \Sigma(1, 2, 3, 5, 7)$$

B) Tabulate the PLA programming table for the four Boolean functions listed in Problem (A). Minimize the number of product terms.