


1. Design a counter which goes through the sequence  
 $000 \rightarrow 010 \rightarrow 100 \rightarrow 001 \rightarrow 011 \rightarrow 101 \rightarrow 111$   


2. Design a 2 bit multiplier ckt using (a) combinational circuit, (b) sequential circuit (using a shift register).

3. Design a ckt which divides the CP by  $n$ .  $2I/P$

4. Design a  $\wedge$ XOR gate using minimum number of  $\wedge$ NAND gates.

5. The following Boolean expression  $BE + \overline{B}\overline{D}\overline{E}$  is a simplified version of the Expression

$$\overline{A}BE + BC\overline{D}E + B\overline{C}\overline{D}E + \overline{A}\overline{B}\overline{D}\overline{E} + \overline{B}\overline{C}\overline{D}\overline{E}.$$

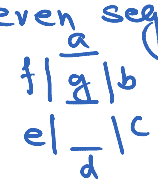
Are there any don't care conditions? If so, what are they?

6. With the use of maps, find the simplest form in sum of products of the function  $F = fg$ , where  $f$  and  $g$  are given by

$$f = wx\overline{y} + \overline{y}z + \overline{w}y\overline{z} + \overline{x}y\overline{z}$$

$$g = (w + x\overline{y} + \overline{z})(\overline{x} + \overline{y} + \overline{z})(\overline{w} + \overline{x} + \overline{z})$$

7. There are two channels in a communication system. The incoming bit streams are  $A_0 A_1 A_2 A_3 \dots A_n$  and  $B_0 B_1 B_2 B_3 \dots B_n$ . Design a ckt such that the o/p sequence from the ckt is  $A_0 B_0 A_1 B_1 A_2 A_3 \dots A_n B_n$ .

8. A seven segment LED display is shown below.  
 Design a combination of sequential and combination a ckt such that the LED display counts from 0 to 9 and then back to 0.

9. Implement Boolean functions using decoders, multiplexers, ROM, PLA etc.

10. Obtain an  $8 \times 1$  multiplexer with a dual 4-line to 1-line multiplexer having separate enable inputs but common selection lines. Use a block diagram construction.

11. Design a 4 bit shift register such that when an input  $x=0$ , it loads an external input at the next CP and when  $x=1$ , it shifts the content of the register to the right inserting 0 in the MSB.

12. Think of practical real problem and then try to find a solution using digital circuits.