



DELD – Tutorial 7



ECED SVNIT

SOP K-Maps

	\bar{B}	B
\bar{A}	0 $\bar{A}\bar{B}$	1 $\bar{A}B$
A	2 $A\bar{B}$	3 AB

	$\bar{B}\bar{C}$	$\bar{B}C$	BC	$B\bar{C}$
\bar{A}	0	1	3	2
A	4	5	7	6

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3	2
$\bar{A}B$	4	5	7	6
AB	12	13	15	14
$A\bar{B}$	8	9	11	10



Mapping Concept

	$\overline{C}\overline{D}$	$\overline{C}D$	CD	$C\overline{D}$
$\overline{A}\overline{B}$	0 1	1	3 1	2 1
$\overline{A}B$	4	5 1	7	6
AB	12	13	15	14
$A\overline{B}$	8	9 1	11 1	10

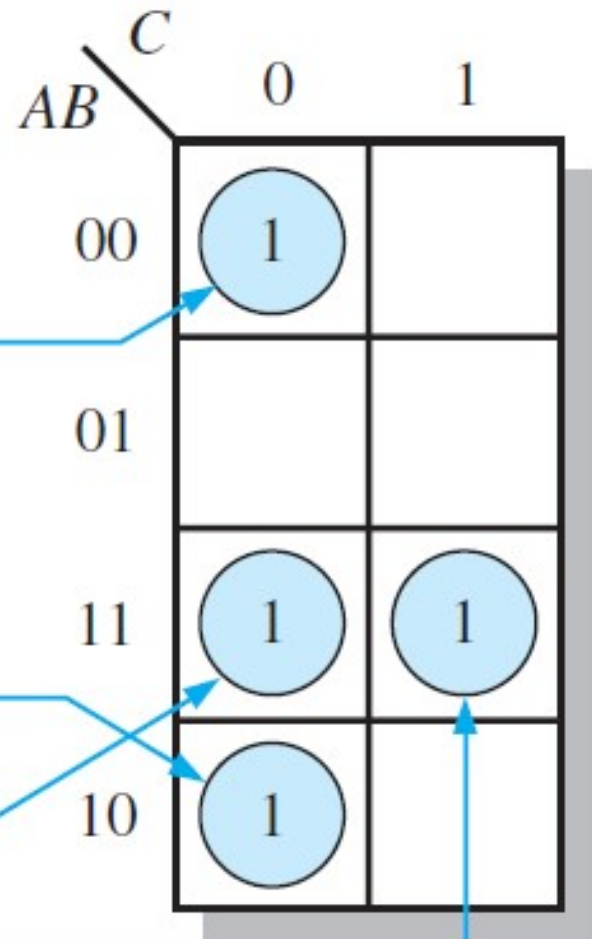
Karnaugh map for $Z = \sum m(0, 2, 3, 5, 9, 11)$



Mapping Concept (From Truth Table)

$$X = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + AB\bar{C} + ABC$$

Inputs			Output
A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1



Mapping of Non-Standard SOP

Map the following SOP expression on a Karnaugh map: $\bar{A} + A\bar{B} + ABC\bar{C}$.

$$\bar{A} + A\bar{B} + ABC\bar{C}$$

000 100 110

001 101

010

011

		C	
		0	1
AB	00	1	1
	01	1	1
	11	1	
	10	1	1

Writing Minimized Expressions

	\bar{C}	C
$\bar{A}\bar{B}$	1	1
$\bar{A}B$	1	
AB		
$A\bar{B}$		

These are the variables that remained constant within each circle.

$$X = \bar{A}\bar{B} + \bar{A}C$$



Question - 1

Simplify the following SOP equation using the Karnaugh mapping technique:

$$X = \overline{A}B + \overline{A}\overline{B}\overline{C} + A\overline{B}\overline{C} + A\overline{B}C$$



Question - 2

Simplify the following equation using the Karnaugh mapping procedure:

$$X = \overline{A}B\overline{C}D + A\overline{B}\overline{C}D + \overline{A}\overline{B}\overline{C}D + AB\overline{C}D + ABC\overline{D} + ABCD$$



Question - 3

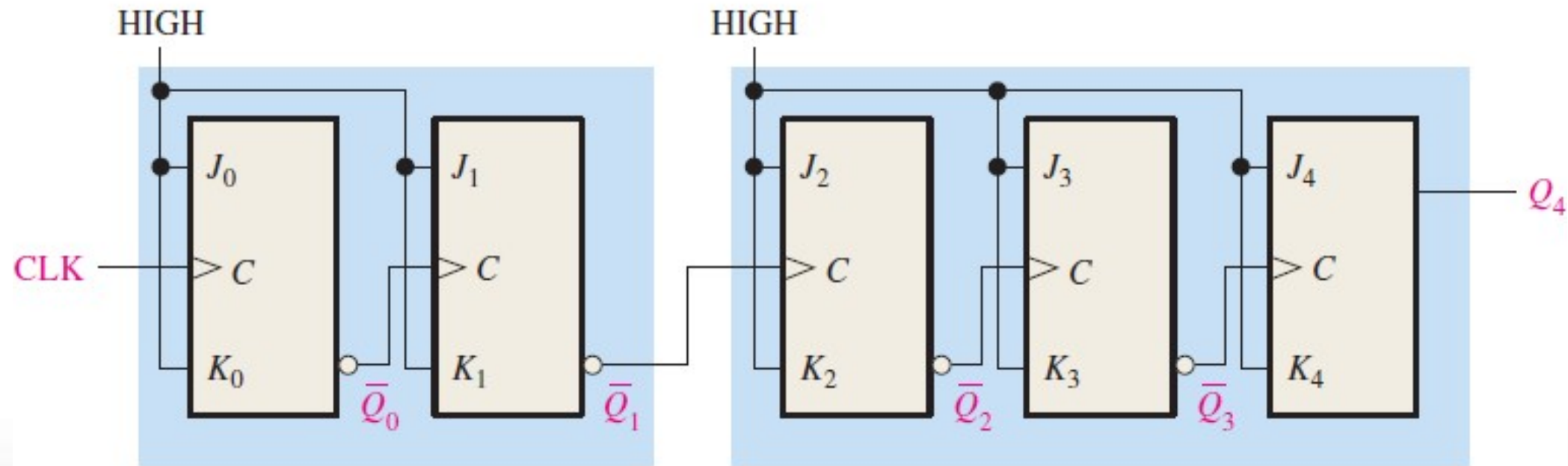
Use a Karnaugh map to minimize the following SOP expression:

$$\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}\overline{C}\overline{D} + A\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}CD + A\overline{B}CD + \overline{A}\overline{B}C\overline{D} + \overline{A}BC\overline{D} + ABC\overline{D} + A\overline{B}C\overline{D}$$



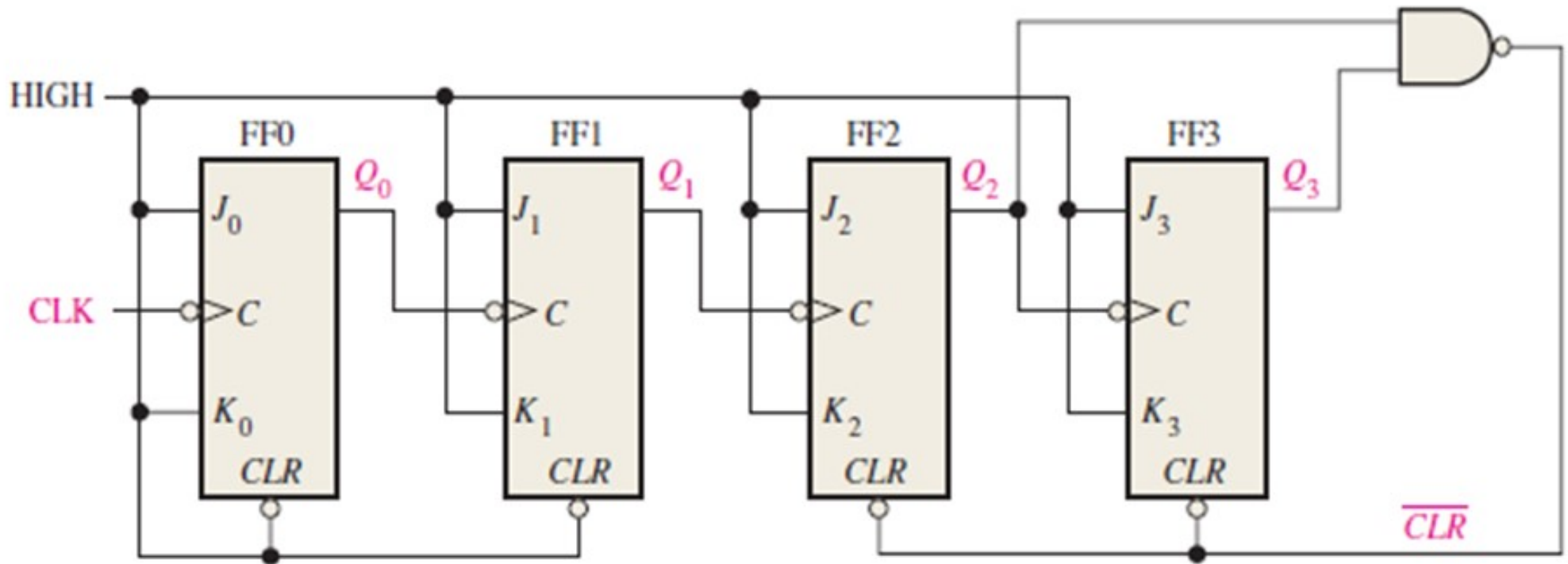
Question - 4

- Determine the type (Synchronous/Asynchronous), (Up/Down), and Modulus of the below structure.



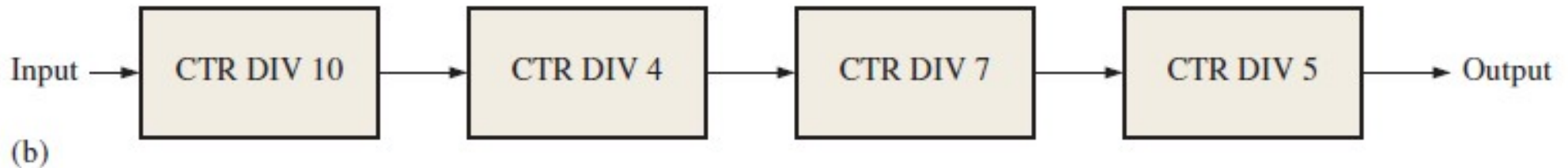
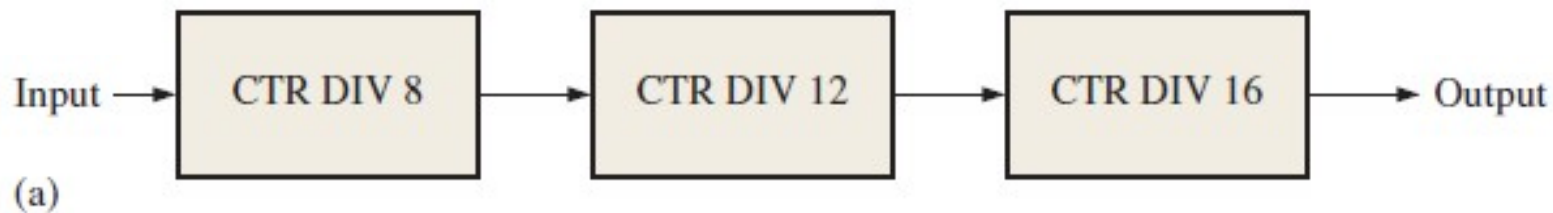
Question - 5

- Determine the Modulus and also write down the valid states ($Q_3Q_2Q_1Q_0$) for the circuit shown below:



Question - 6

- Determine the overall Modulus for both the Configurations. Also determine the output frequency for each case if the input frequency is 268800 Hz.



To Be Continued...

