

Exp no - 6

Date → 3rd September 2020

Aradi Mahajan
19BEE0032

Aim → Logic converters

→ Binary to Gray code

→ Gray code to Binary code

Apparatus required →

Name	Specialization	Quantity
Source	Digital kit	6
7400	7486	4

Truth table / Boolean equation / Logic diagram →

1) Binary

B ₂	B ₁	B ₀	Gray		
			G ₂	G ₁	G ₀
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	1
0	1	1	0	1	0
1	0	0	1	1	0
1	0	1	1	1	1
1	1	0	1	0	1
1	1	1	1	0	0

		B_1, B_0			
		00	01	11	10
B_2	0	0	0	0	0
	1	1	1	1	1

$$G_2 = B_2$$

		B_1, B_0			
		00	01	11	10
B_2	1	0	0	1	1
	2	1	1	0	0

$$G_1 \rightarrow B_2 \bar{B}_1 + \bar{B}_2 B_1$$

$$= B_1 \oplus B_2$$

		B_1, B_0			
		00	01	11	10
B_2	0	0	1	0	1
	1	0	1	0	1

$$G_0 \rightarrow \bar{B}_1 B_0 + B_1 \bar{B}_0$$

$$= B_1 \oplus B_0$$

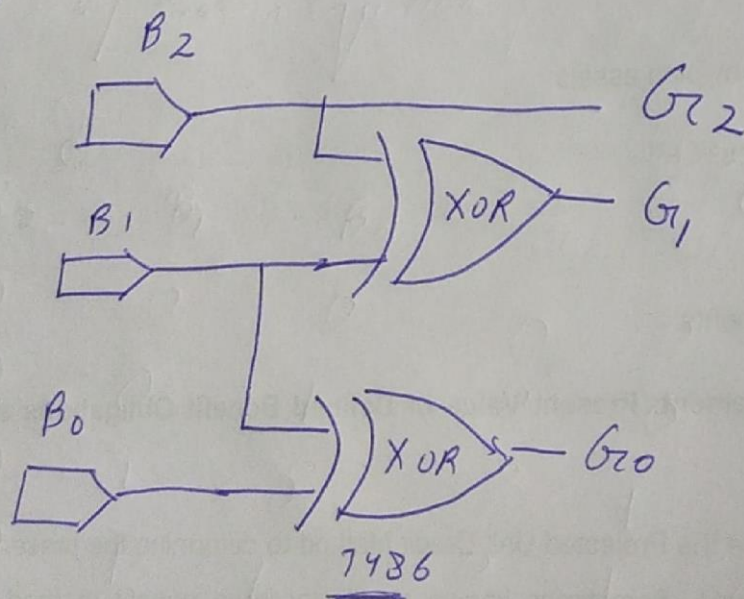
$$B_2 \rightarrow \underbrace{0000}_{\text{OFF} \rightarrow 4m} \underbrace{1111}_{\text{OFF} \rightarrow 4m}$$

$$B_1 \rightarrow \underbrace{00}_{\text{OF} \rightarrow 2m} \underbrace{11}_{2m} \underbrace{00}_{2m} \underbrace{11}_{\text{OF} \rightarrow 2m}$$

$$B_0 \rightarrow \underbrace{0}_{\text{OFF} \rightarrow 1m} \underbrace{1}_{\text{OF} \rightarrow 1m} \underbrace{0}_{\text{OFF} \rightarrow 1m} \underbrace{1}_{\text{OF} \rightarrow 1m} \underbrace{0}_{\text{OFF} \rightarrow 1m} \underbrace{1}_{\text{OF} \rightarrow 1m} \underbrace{0}_{\text{OFF} \rightarrow 1m} \underbrace{1}_{\text{OF} \rightarrow 1m}$$

Run to two $\rightarrow \mathcal{J}_m$

Logic diagram



2) Gray to Binary

Gray

Binary

$G_2 \quad G_1 \quad G_0$

$B_2 \quad B_1 \quad B_0$

0 0 0

0 0 0

0 0 1

0 0 1

0 1 1

0 1 0

0 1 0

0 1 1

1 1 0

1 0 0

1 1 1

1 0 1

1 0 1

1 1 0

1 0 0

1 1 1

Run to

time same as

before.

$B_2 \rightarrow$

$G_2 \backslash G_1 G_0$	00	01	11	10
0	0	0	0	0
1	1	1	1	1

$B_1 \rightarrow$

$G_2 \backslash G_1 G_0$	00	01	11	10
0	0	0	1	1
1	1	1	0	0

$$G_2 \rightarrow B_2$$

$$B_1 \rightarrow \overline{G_2} G_1 + G_2 \overline{G_1}$$

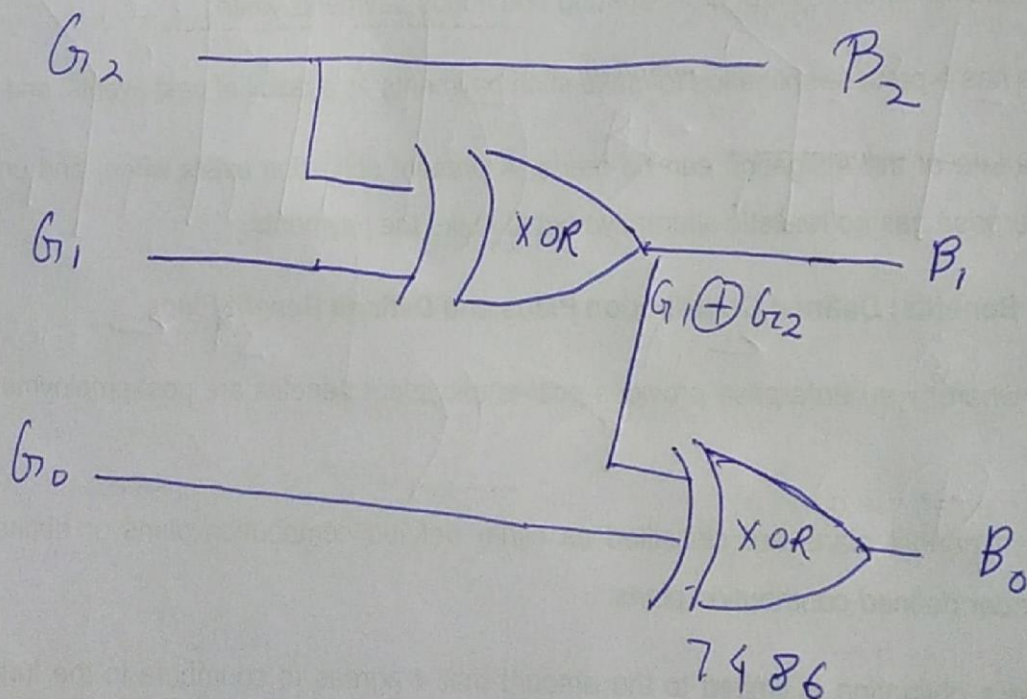
$$= G_2 \oplus G_1$$

$B_0 \rightarrow$

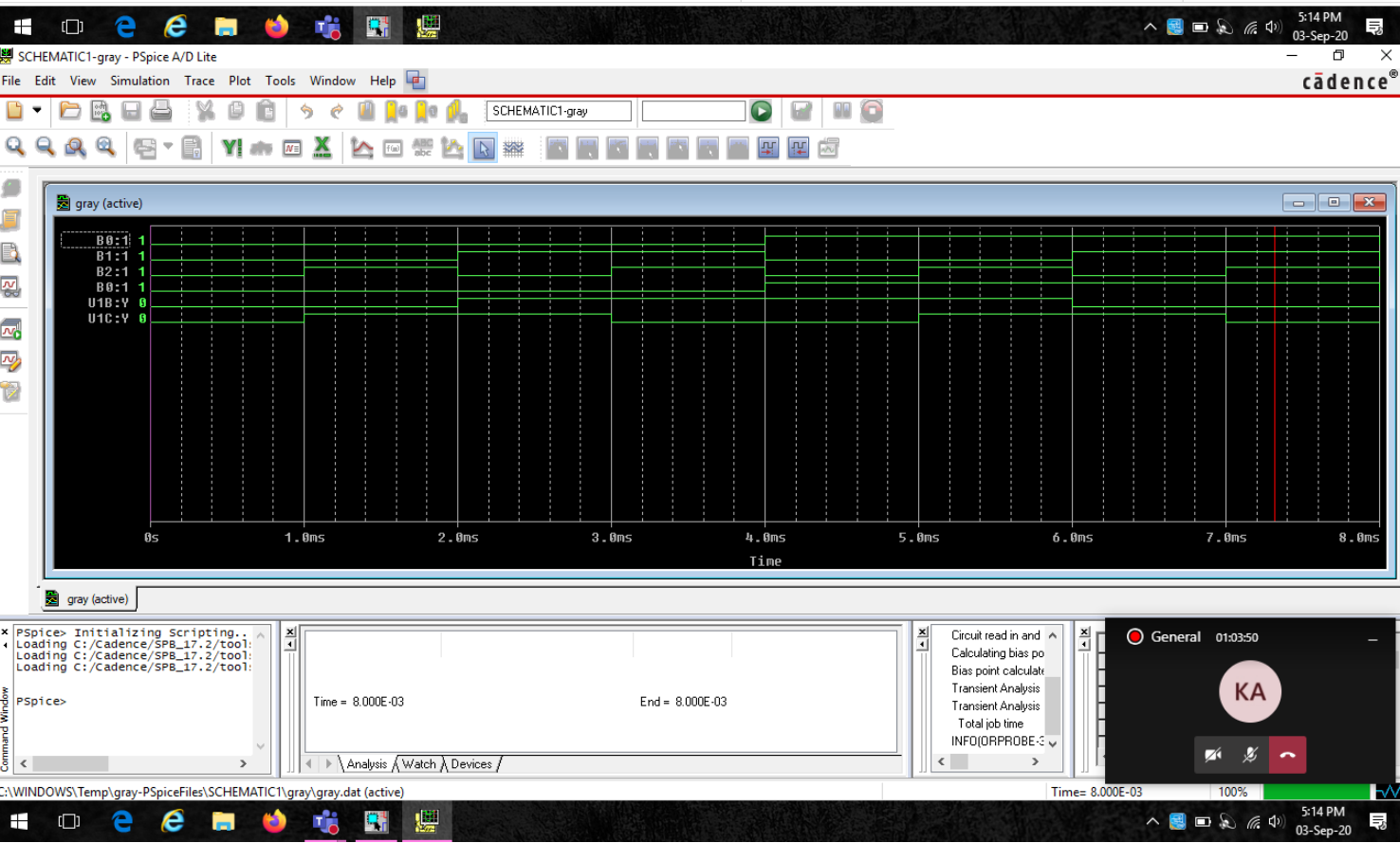
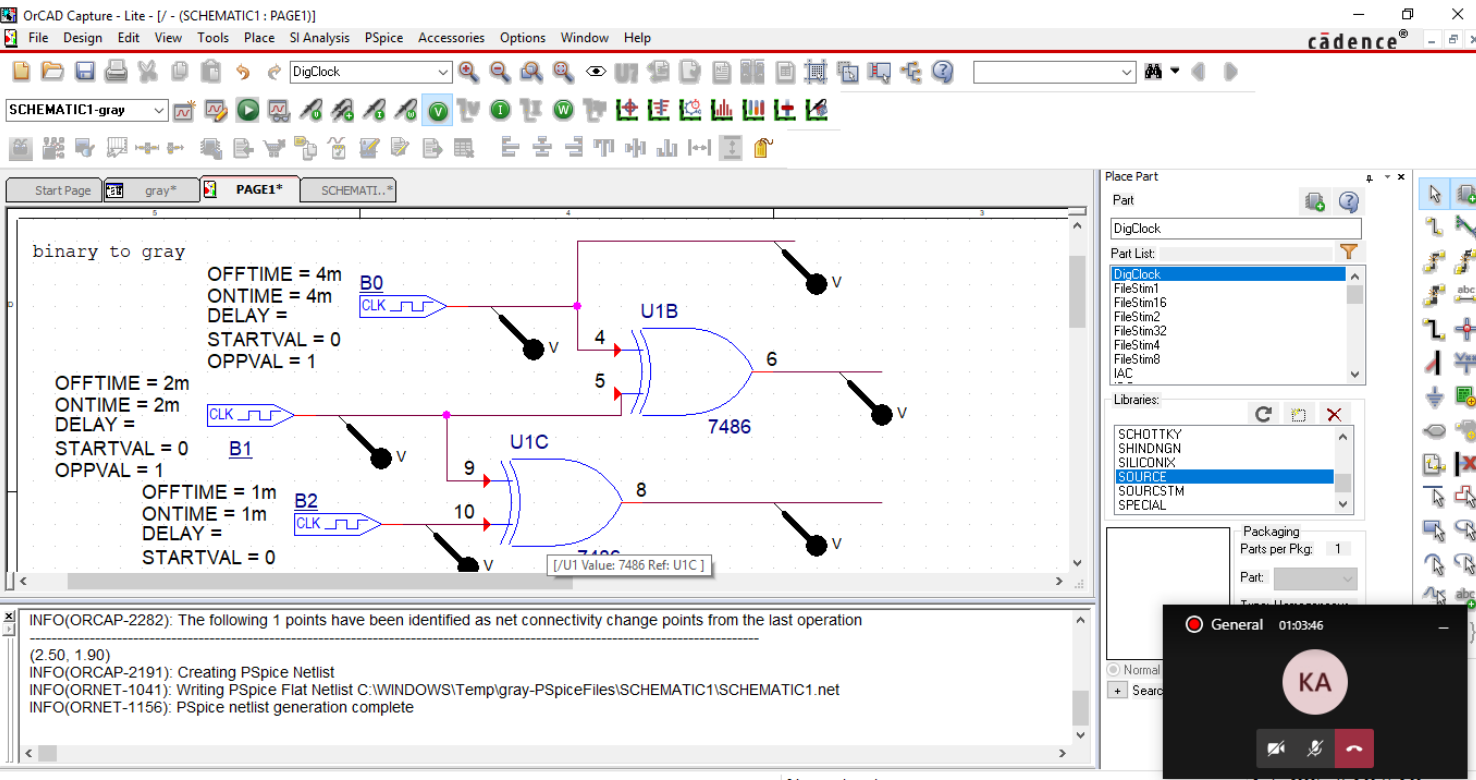
$G_1 G_2$	00	01	11	10
G_2				
0	0	1	0	1
1	1	0	1	0

$$\begin{aligned}
 B_0 &= G_2 \bar{G}_1 \bar{G}_0 + \bar{G}_2 \bar{G}_1 G_0 + G_2 G_1 G_0 + \bar{G}_2 G_1 \bar{G}_0 \\
 &= G_2 (\bar{G}_1 \bar{G}_0 + G_1 G_0) + \bar{G}_2 (G_1 \bar{G}_0 + \bar{G}_1 G_0) \\
 &= G_2 (G_1 \odot G_0) + \bar{G}_2 (G_1 \oplus G_0) \\
 &= G_2 (\overline{G_1 \oplus G_0}) + \bar{G}_2 (G_1 \oplus G_0) \\
 &= G_1 \oplus G_2 \oplus G_0
 \end{aligned}$$

Logic diagram



SIMULATION DIAGRAM AND OUTPUT GRAPH:-



OrCAD Capture - Lite - [/ - (SCHEMATIC1: PAGE1)]

File Design Edit View Tools Place SI Analysis PSpice Accessories Options Window Help

SCHEMATIC1-gray

gray to binary

OFFTIME = 4m
ONTIME = 4m
DELAY =
STARTVAL = 0
OPPVAL = 1

OFFTIME = 2m
ONTIME = 2m
DELAY =
STARTVAL = 0
OPPVAL = 1

OFFTIME = 1m
ONTIME = 1m
DELAY =
STARTVAL = 0
OPPVAL = 1

G0 CLK

G1 CLK

G2 CLK

U2B

U2C

7486

7486

Place Part

Part

DigClock

Part List:

DigClock
FileStim1
FileStim16
FileStim2
FileStim32
FileStim4
FileStim8
IAC

Libraries:

SCHOTTKY
SHINDNGN
SILICONIX
SOURCE
SOURCSTM
SPECIAL

Packaging

Parts per Pkg: 1

Type: Homogeneous

Normal Convert

Search for Part

INFO(ORCAP-2191): Creating PSpice Netlist
INFO(ORNET-1041): Writing PSpice Flat Netlist C:\WINDOWS\Temp\gray-PSpiceFiles\SCHEMATIC1\SCHEMATIC1.net
INFO(ORNET-1156): PSpice netlist generation complete
INFO(ORCAP-2191): Creating PSpice Netlist
INFO(ORNET-1041): Writing PSpice Flat Netlist C:\WINDOWS\Temp\gray-PSpiceFiles\SCHEMATIC1\SCHEMATIC1.net
INFO(ORNET-1156): PSpice netlist generation complete

0 items selected

Scale=200% X=9.10 Y=0.90

5:28 PM
03-Sep-20

SCHEMATIC1-gray - PSpice A/D Lite

File Edit View Simulation Trace Plot Tools Window Help

gray (active)

0s 1.0ns 2.0ns 3.0ns 4.0ns 5.0ns 6.0ns 7.0ns 8.0ns

Time

gray (active)

Time = 8.000E-03 End = 8.000E-03

Analysis Watch Devices

Command Window

PSpice> Initializing Scripting..
Loading C:\Cadence\SPB_17.2\tool:
Loading C:\Cadence\SPB_17.2\tool:
Loading C:\Cadence\SPB_17.2\tool:

Circuit read in and
Calculating bias po
Bias point calcula
Transient Analysis
Transient Analysis
Total job time
INFO(ORPROBE-3

Trace Color	Trace Name	Y1	Y2
	X Values	7.2432m	0.000
	CURSOR 1,2	1	0
	G0:1	1	0
	G1:1	1	0
	G2:1	1	0
	G0:1	1	0

C:\WINDOWS\Temp\gray-PSpiceFiles\SCHEMATIC1\gray.dat (active)

Time= 8.000E-03 100%

5:28 PM
03-Sep-20

Result \in inferences \rightarrow The equation $B_0, G_1, \&$

G_2, B_2 are some only equations of $B_0 \in \mathbb{R}$, are
different from each other.