

Bilal Ahmed Khan (20K-0183) Sec: B

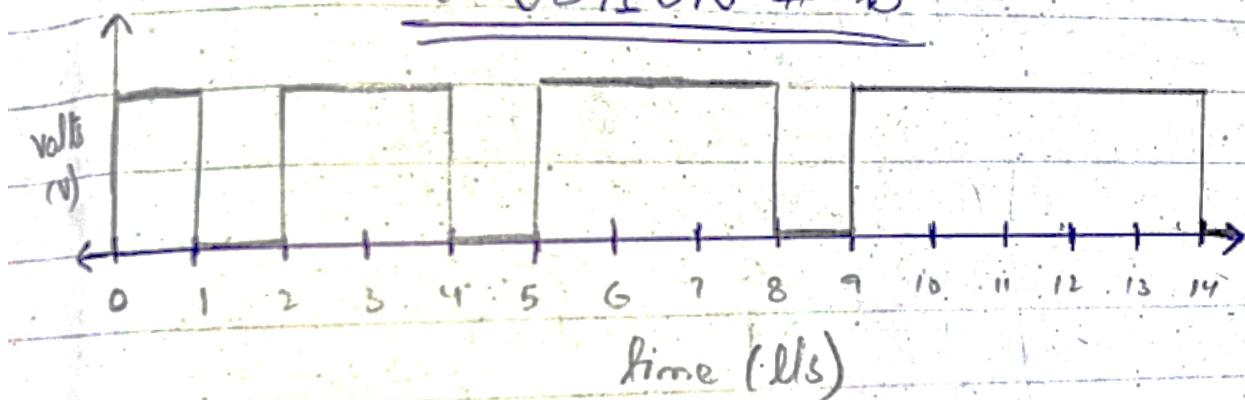
DLD

ASSIGNMENT

QUESTION # a

- a) Laptops
- b) Speakers
- c) Projectors

QUESTION # b



QUESTION # c

Bit sequence: 10110111011111

QUESTION #d

Serial transfer time = 8 ms
Parallel transfer time = 1 ms

QUESTION #e

$$\text{duty cycle} = \frac{T_w}{T} = 70\%$$

$$f_2 = 400 \text{ KHz} = 400,000 \text{ Hz}$$

$$T = ? , T_w = ?$$

For T :

$$T = \frac{1}{f} = \frac{1}{400000}$$

$$T = 2.5 \times 10^{-6} \text{ s}$$

OR

$$T = 2.5 \mu\text{s}$$

For T_w :

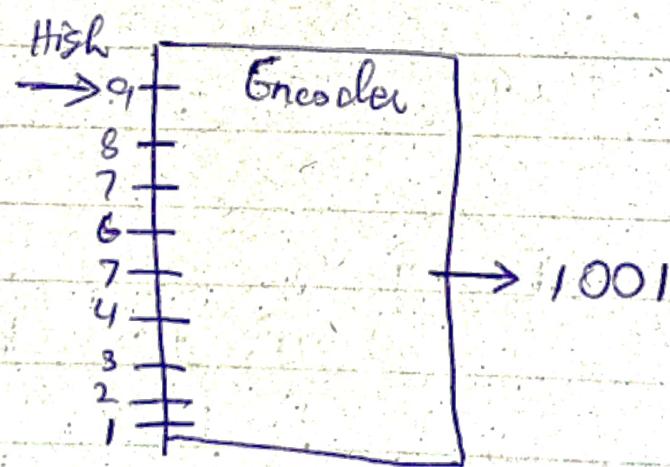
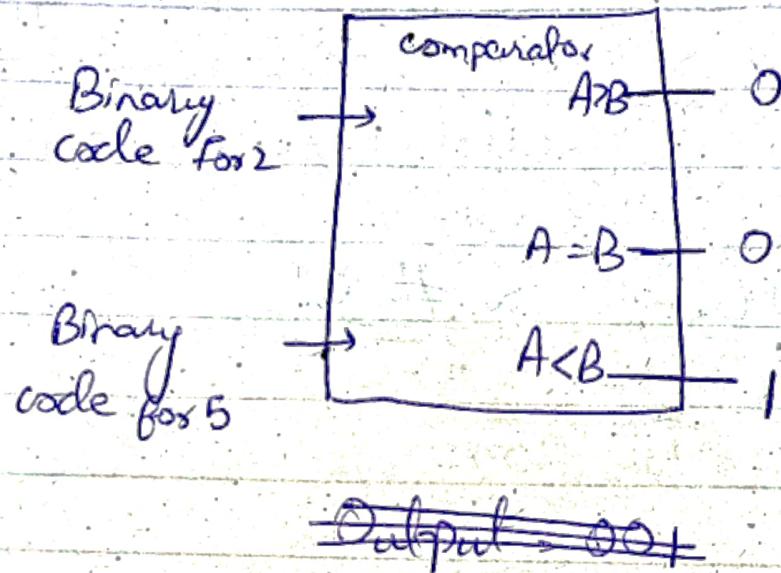
$$T_w = 0.7(T) = 0.7(2.5 \times 10^{-6})$$

$$T_w = 1.75 \times 10^{-6} \text{ s}$$

OR

$$T_w = 1.75 \mu\text{s}$$

QUESTION #7



QUESTION #8

i) 1600_{10}

Decimal to octal

$$1600_{10} \rightarrow 3100_8$$

8	1600	\rightarrow
8	200	$\rightarrow 0$
8	25	$\rightarrow 1$
	3	$\rightarrow 3$

Decimal to Hexadecimal

$$1600_{10} = 640_{16}$$

Decimal to BCD:

$$1600_{10} = 0001\ 0110\ 0000\ 0000_{BCD}$$

16	1600	$\rightarrow 0$
16	100	$\rightarrow 4$
16	6	$\rightarrow 6$

1 6 0 0
0001 0110 0000 0000

ii) 10000_2

Binary to decimal

$$10000_2 = 1 \cdot (1) + 0 \cdot (0) + 0 \cdot (4) + 0 \cdot (2) + 1 \cdot (0)$$
$$\boxed{10000_2 = 16_{10}}$$

Der Binary to Octal

$$10000_2 = 20_8$$

$$\begin{array}{r} 8 | 16 \rightarrow \\ 2 \rightarrow \end{array}$$

Binary to Hexa decimal

$$10000_2 = 10_{16}$$

$$\begin{array}{r} 16 | 16 \rightarrow 0 \\ 1 \rightarrow 1 \end{array}$$

Binary to BCD

$$10000_2 = (0001 \ 0110)_{BCD}$$
$$\begin{array}{r} 1 \ 6 \\ 0001 \ 0110 \end{array}$$

iii) 564_{10}

Decimal to Octal

$$564_{10} \rightarrow (1064)_8$$

8	564 → 4
8	70 → 6
8	8 → 0
	1 → 1

Decimal to Hexadecimal

$$564_{10} \rightarrow (234)_{16}$$

16	564 → 4
16	35 → 3
	2 → 2

Decimal to BCD

$$564_{10} \rightarrow (0101\ 0110\ 0100)_{BCD}$$

5 6 4

0101 0110 0100

iv) 10000_{10}

Decimal to octal

$$10000_{10} = (23420)_8$$

8	<u>10000₁₀</u>
8	<u>1250 → 2</u>
8	<u>156 → 4</u>
8	<u>19 → 3</u>
2	<u>→ 2</u>

Decimal to hexadecimal

$$10000_{10} = (2710)_16$$

16	<u>10000₁₀</u>
16	<u>625 → 1</u>
16	<u>39 → 7</u>
2	<u>→ 2</u>

Decimal to BCD:

$$10000_{10} = 0001\ 0000\ 0000\ 0000\ 0000$$

1	0	0	0	0
0001	0000	0000	0000	0000

QUESTION # h

i) 783_{10}

Decimal into Binary

$$(783)_{10} = 1100001111_2$$

2	783	$\rightarrow 1$
2	391	$\rightarrow 1$
2	195	$\rightarrow 1$
2	97	$\rightarrow 1$
2	48	$\rightarrow 0$
2	24	$\rightarrow 0$
2	12	$\rightarrow 0$
2	6	$\rightarrow 0$
2	3	$\rightarrow 1$
	1	$\rightarrow 1$

$$\text{ii) } 1220.82_{10}$$

$$1220.82_{10} = (10011000100, 1101000)_2$$

2	1220	$\rightarrow 0$
2	610	$\rightarrow 0$
2	305	$\rightarrow 1$
2	152	$\rightarrow 0$
2	76	$\rightarrow 0$
2	38	$\rightarrow 0$
2	19	$\rightarrow 1$
2	9	$\rightarrow 1$
2	4	$\rightarrow 0$
2	2	$\rightarrow 0$
1		$\rightarrow 1$

$$0.82 \times 2 = 1.64 \quad |1$$

$$0.64 \times 2 = 1.28 \quad |1$$

$$0.28 \times 2 = 0.56 \quad |0$$

$$0.56 \times 2 = 1.12 \quad |1$$

$$0.12 \times 2 = 0.24 \quad |0$$

$$0.24 \times 2 = 0.48 \quad |0$$

$$0.48 \times 2 = 0.96 \quad |0$$

$$0.96 \times 2 = 1.92 \quad |1$$

iii) 0110010110_2

$$0110010110_2 = 512(0) + 256(1) + 128(1) + 64(0) + \\ 32(0) + 16(1) + 8(0) + 4(1) + 2(1) \\ + 1(0)$$

$$0110010110_2 = (406)_{10}$$

iv) 1111.0101_2

$$1111.0101_2 = 8(1) + 4(1) + 2(1) + 1(1) + 0.5(0) \\ + 0.25(1) + 0.125(0) + 0.0625(1)$$

$$(1111.0101_2 = 15.3125)_{10}$$

QUESTION # i

i) $33 \& 15$

$$\begin{array}{r} 33_{10} = 0010\ 0001_2 \\ 15_{10} = +0000\ 1111_2 \\ \hline 0011\ 0000_2 \end{array}$$

An

ii) $56 \& -27$

$$\begin{array}{r} 56_{10} = 0011\ 1000 \\ -27_{10} = ? \end{array}$$

$$27 = 0001\ 1011$$

$$15 \text{ complement} = 1110\ 0100$$

$$-27 = \underline{1110\ 0101}$$

Now,

$$56_{10} = 0011\ 1000$$

$$-27_{10} = 1110\ 0101$$

$$\underline{1000\ 1101_2}$$

iii) 246 and 25

$$\begin{array}{r} 246_{10} = 00000000 \quad 111 \\ 25_{10} = 00000000 \quad 00011001 \\ \hline 00000001000011111 \end{array}$$

An.

QUESTION # j

(Multiplication)

i) 00110010×00001010

$$\begin{array}{r} 00110010 \\ \times 00001010 \\ \hline 00000000 \\ 00110010 \times \\ 000000000x \\ 001110010x \\ 0000060000x \\ 0000000000x \\ 0000000000x \\ \hline 0000000000x \\ 00000000011110100 \end{array}$$

An.

ii)

~~1111 11010~~

~~0000 00~~

$A = 1111 \ 1010$

$B = 0000 \ 0001$

Since signs are different answers will be -ve

2's complement of A.

$A = 1111 \ 1010$

$0000 \ 0101$

$A' = \underline{0000 \ 0110}$

Now, 00000110

$\times 1000000101$

$\underline{0000 \ 0110}$

$00000000x$

$00000000x$

$00000000x$

$00000000x$

$00000000x$

$\underline{00000000x}$

00000000000110

But since the answer is -ve we will take
2's complement

Answer

$$\begin{array}{r} 0000 \quad 0110 \\ 1111 \quad 1001 \\ \hline \end{array}$$

+1

$$\begin{array}{r} 1111 \quad 1010 \\ \hline \end{array}$$

Ans

iii) $0001 \quad 0101$ multiplied by
 $1111 \quad 1011$

Since the signs are different
answer will be -ve

$$B = \begin{array}{r} 1111 \quad 1011 \\ 0000 \quad 0100 \\ \hline \end{array}$$

+1

$$B'' = \underline{\underline{0000 \quad 0101}}$$

$$\begin{array}{r}
 0001 \quad 0101 \\
 \times 0000 \quad 0101 \\
 \hline
 0001 \quad 0101 \\
 00000000x \\
 0000000010101 \\
 00000000000x \\
 00000000000x \\
 00000000000x \\
 \hline
 00000000010101001
 \end{array}$$

But since the answer is we'll have
to write in its complement form.

Answer

01101001

1001 0110

$\frac{1}{2} \cdot 1 + 1$

1001011

QUESTION #j

(Division Part)

i) 00111010 divided by
0000 1010

Taking 2's complement of divisor

divisor = 0000 1010

1111 0101

+ 1

1111 0110

Now,

Quotient:

0001

0010

0011

0110

0101

① 0 011 1010

+ 1 111 0110

1 111 0110

+ 1 0 0 1 0 0 1 1 1 0

1 0 0 1 0 0 1 1 1 0

+ 1 1 1 1 0 1 1 0

1 0 0 1 0 0 1 0

$$\begin{array}{r}
 & 1 & 1 & 1 & 1 & 1 \\
 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\
 + & 1 & 1 & 1 & 1 & 0 & 1 & 0 \\
 \hline
 & 1 & 0 & 0 & 0 & 1 & 0 & 0
 \end{array}$$

Thus.. 0101 is the answer]

ii) 1111 1010 divided by
0000 0001

Now since the signs of both divisor & dividend are different answer will be -ve.

Taking 2's complement of dividend

dividend = 1111 1010
0000 0101

+1
dividend: 0000 0110

Taking 2's complement of divisor

divisor: 0000 0001

1111 1110
+1

divisor: 1111 1111

Now dividing;

Quotient

0001

0010

0011

0100

0101

0110

$$\begin{array}{r} 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \\ \times 1 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 1 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \quad 1 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \quad 1 \\ + 1 \quad 1 \\ \hline 1 \quad 0 \end{array}$$

Answer: 0000 0110

but since answer is -ve we take 2's complement
Answer: 0000 0110

1111 1001

Answer: 1111 1010

An.

iii) $0001\ 0101$ divided by
 $1111\ 1011$

Since both have different sizes
Answer will be -ve
Now dividing:

Quotient	$\begin{array}{r} 1111 \\ 0001\ 0101 \\ + 1111\ 1011 \\ \hline 0000\ 11000 \\ + 1111\ 1011 \\ \hline 0000\ 1011 \\ + 1111\ 1011 \\ \hline 0000\ 0101 \\ + 1111\ 1011 \\ \hline 1111\ 1100 \end{array}$
0001	
0010	
0011	
0100	

Neglecting since -ve

Now,

Answer = 0100
but we have to write in 2's complement form

$$\begin{array}{r} 0100 \\ 1011 \\ + 1 \\ \hline \end{array}$$

Answer 1100

QUESTION #1

i) 0100_2 to BCD

$$0100_2 = 8(0) + 4(1) + 2(0) + 1(0)$$

$$\boxed{0100_2 = 4_{10}}$$

Now,

$$0100_2 = \boxed{4_{10} = 0100_{BCD}}$$

(Stays the same)

ii) 1000_8 to BCD.

$$1000_8 = 512(1) + 64(0) + 8(0) + 8^0(0)$$

$$\boxed{1000_8 = 512_{10}}$$

Now,

$$\begin{array}{r} 5 \\ 1 \\ \downarrow \\ 0101 \end{array} \quad \begin{array}{r} 1 \\ \downarrow \\ 0001 \end{array} \quad \begin{array}{r} 2 \\ \downarrow \\ 0010 \end{array}$$

$$1000_8 = 0101 \quad 0001 \quad 0010$$

BCD

iii) 11010_2 to Gray

$$\begin{array}{r} 1+1 \rightarrow 0 \rightarrow 1 \rightarrow 0 \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 1 \quad 0 \quad 1 \quad 1 \quad 1 \end{array}$$

$$11010_2 = 10111$$

Gray

iv) AA₁₆ to BCD

~~$AA_{16} = 16(10) + 16^{\circ}(10)$~~

~~$AA_{16} = 192_{10}$~~

$$AA_{16} = 16(10) + 16^{\circ}(10)$$

$$= 160 + 10$$

$$\overline{AA_{16}} = 170_{10}$$

$$\begin{array}{r} 1 \quad 7 \quad 0 \\ \downarrow \quad \downarrow \quad \downarrow \\ 0001 \quad 0111 \quad 0000 \end{array}$$

$$AA_{16} = 0001 \quad 0111 \quad 0000 \quad | \quad \underline{A_{16}}$$

v) 1000 Gray to Binary.

$$1 \xrightarrow{+0} 0 + 0 \xrightarrow{+0} 0$$

$$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$

$$1 \quad 1 \quad 1 \quad 0$$

$$1000_{\text{Gray}} = 1110_2$$

Ans