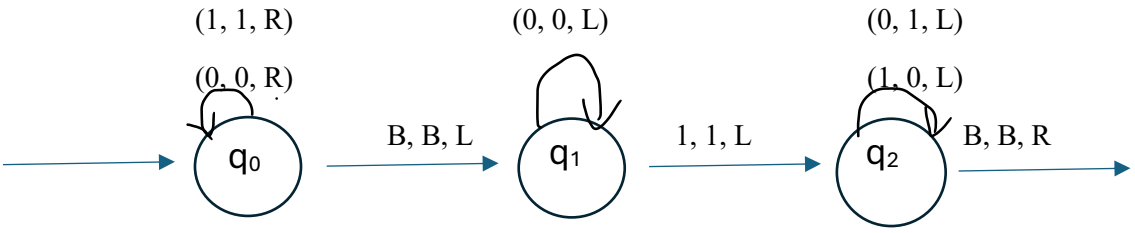
Name: Md Rayanul Islam Chowdhury

Student ID: 202247359

Answer No 1



Turing machine for Two's Complement

Answer No 2

229	101	37	5	5	5	1	1
-128	-64	-32	-16	-8	-4	-2	-1
101	37	5	Skip	Skip	1	Skip	0

1	1	1	0	0	1	0	1

$(229)_{10} = (11100101)_2$

Answer No 3

a)

Binary	1100	0111	1011	1010
Hex	C	7	B	A

Hexadecimal of 1100 0111 1011 1010 is C 7 B A

b)

Binary	001	100	011	110	111	010
Octal	1	4	3	6	7	2

Octal of 1100 0111 1011 1010 is 1 4 3 6 7 2

Answer No 4

a)

For the binary number 10011010:

1 * 2^7 + 0 * 2^6 + 0 * 2^5 + 1 * 2^4 + 1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 0 * 2^0

= 128 + 16 + 8 + 2

= 154

b)

The leftmost bit is 1, indicating a negative number. To find the value, invert the bits and then add 1:

Inverted: 01100101

Add 1: 01100110

01100110 = -(0*(2^7) + 1*2^6 + 1*2^5 + 0*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 0*2^0)

= -(64 + 32 + 4 + 2)

= -102

Answer No 5

a) The highest positive number in a 32-bit Two's Complement is 2^31 - 1 = 2,147,483,647.

b) 32-bit representation: 01111111 11111111 11111111 11111111.

c) The lowest negative number is -2^31 = -2,147,483,648.

d) 10000000 00000000 00000000 00000000

Answer no 6

a)

765	253	253	125	61	29	13	5	1	1
-512	-256	-128	-64	-32	-16	-8	-4	-2	-1
253	Skip	125	61	29	13	5	1	Skip	1

1	0	1	1	1	1	1	1	0	1

Binary of 765 is 001011111101

1027	3	3	3	3	3	3	3	3	3	1
-1024	-512	-256	-128	-64	-32	-16	-8	-4	-2	-1
3	Skip	Skip	Skip	Skip	Skip	Skip	Skip	Skip	1	0

1	0	0	0	0	0	0	0	0	1	1

Binary of 1027 is 010000000011

To find -1027

Inverted: 101111111100

Add 1: 101111111101

Binary of -1027 is 101111111101
Therefore 765 - 1027 =

0 0 1 0 1 1 1 1 1 1 0 1 (765)

+ 1 0 1 1 1 1 1 1 1 1 0 1 (-1027)

1 1 1 0 1 1 1 1 1 0 1 0

The leftmost bit is 1, indicating a negative number. To find the Decimal, invert the bits and then add 1

Inverted: 000100000101

Add 1: 000100000110

Decimal of 000100000110 is 262

Decimal of 111011111010 is -262

765 - 1027 = -262 or 111011111010

b)

The maximum positive value in a 12-bit Two's Complement system is 2^11 - 1 = 2047, and the sum of 1023 and 1025 is 2048, which is beyond this limit. We can't calculate 1023 + 1025 in a 12-bit Two's Complement system because the result (2048) exceeds the maximum representable value, leading to an overflow.