ICS 2020 Problem Sheet #5

Problem 5.1:

a)

1)

The largest number that can be represented is 4444 in base 5 which is equal to:

4*5^3+4*5^2+4*5+4 = 624 in base 10

the smallest is -624 in base 10

2)

for the largest number: for 625:

1	0	0	0	0	5
625	125	25	5	1	

there is 5 digits.

for 624:

624= 4x125 + 4x25 + 4x5 + 4x1

0	4	4	4	4	5
625	125	25	5	1	

since if we only add 1 to 624 we will need 5 digits

then the largest number that can be represented is 624_{10} $=4444_5$

b) convert 1_{10} to base 5 :

0	0	0	1	5
125	25	5	1	

then $(1)_{10}$ $=0001_5$

then $(-1)_{10}$ $=4440_5$+1=4444_5

convert 8_{10} to base 5 :

8= (1x5 + 3x1)

0	0	1	3	5
125	25	5	1	

then $(8)_{10}$ $=(0013)_5$

then $(-8)_{10} = (4431)_5 + 1 = 4432_5$

c)

+	4	4	4	4	5
	4	4	3	2	
	4	4	3	1	

after converting:
$-(0014)_5 = (-(0x125 + 0x25 + 1x5 + 4x1))_{10}$
$-(0014)_5 = -9_{10}$

<u>Problem 5.2:</u>

a)the binary representation of 273
the remainder of 273 ÷ 2 is 1
the remainder of 136 ÷ 2 is 0
the remainder of 68 ÷ 2 is 0
the remainder of 34 ÷ 2 is 0
the remainder of 17 ÷ 2 is 1
the remainder of 8 ÷ 2 is 0
the remainder of 4 ÷ 2 is 0
the remainder of 2 ÷ 2 is 0
the remainder of 1 ÷ 2 is 1

then 273_{10} = 100010001

since 0.15=0.00100110011001….
we will take 0.15=0.00100110011001
now we have got to add the power(8) in order to get the exponent

we get 135:
the remainder of 135 ÷ 2 is 1
the remainder of 67 ÷ 2 is 1
the remainder of 33 ÷ 2 is 1
the remainder of 16 ÷ 2 is 0
the remainder of 8 ÷ 2 is 0
the remainder of 4 ÷ 2 is 0
the remainder of 2 ÷ 2 is 0
the remainder of 1 ÷ 2 is 1
then 135_{10}=10000111

since -273.15<0 then S=1
we can then conclude that [1|10000111|00010001001001100110011]

b)
-1000100014.00100110011001100110011001 =
-2^7 - 2^3 - 2^0 - 2^(−3) - 2^(−4) - 2^(−5) - 2^(−8) - 2^(−9) - 2^(−10) -2^(−11)
- 2^(−14)-... - 2^(−23)
=−273, 1499938964843$_{10}$

Problem 5.3: