Practical 2

Number Representation

NOTE: Use of internet is not permitted, calculators are permitted and your answers must include worked solutions. If you require extra sheet(s) please write your name and student number at the top of each additional sheet.

Part A

Objective

Convert decimal numbers to binary showing in detail the conversion process

1. Convert the number of days in a leap year 366_{10} to $Base_2$

Xn	number count	remainder	total	Binary	total
2*8	256	110	256	1 0000 0000	1 0000 0000
2*7	128	110	256	0 1000 0000	1 0000 0000
2*6	64	46	320	0 0100 0000	1 0100 0000
2*5	32	14	352	0 0010 0000	1 0110 0000
2*4	16	14	352	0 0001 0000	1 0110 0000
2*3	8	6	360	0 0000 1000	10110 1000
2*2	4	2	364	0 0000 0100	1 0110 1100
2*1	2	0	366	0 0000 0010	1 0110 1110
2*0	0	0	366	0 0000 0001	1 0110 1110

2. Convert the number of available seats in the new Páirc Uí Chaoimh $45{,}000_{10}$ to $Base_2$

Xn	Number	remainder	binary	total
2*15	32,768	12,232	1 0000 0000 0000 0000	1 0000 0000 0000 0000
2*13	8,192	4,040	0 0100 0000 0000 0000	1 0100 0000 0000 0000
2*11	2,048	1992	0 0001 0000 0000 0000	1 0101 0000 0000 0000
2*10	1024	968	0 0000 1000 0000 0000	1 0101 1000 0000 0000
2*9	512	456	0 0000 0100 0000 0000	1 0101 1100 0000 0000
2*8	256	200	0 0000 0010 0000 0000	1 0101 1110 0000 0000
2*7	128	72	0 0000 0001 0000 0000	1 0101 1111 0000 0000
2*6	64	8	0 0000 0000 1000 0000	1 0101 1111 1000 0000
2*5	8	0	0 0000 0000 0001 0000	1 0101 1111 1001 0000

45,000 = 1 0101 1111 1001 0000

Part B

Objective

Convert numbers $base_n$ to hexadecimal showing in detail the conversion process

1. Convert the number 181336782_{10} to $Base_{16}$

181,336,782 =
1010,1100,1110,1111,1010,1100,1110

1010 = 10 = A
1100 = 12 = C
1110 = 14 = E
1111 = 15 = F
1010 = 10 = A
1100 = 12 = C
1110 = 14 = E

2. Convert the number $C0FF.EE_{16}$ to $Base_{10}$ directly

C = 12 = 1100
0 = 0 = 0000
F = 15 = 1111
F = 15 = 1111
. = ?
E = 14 = 1110
E = 14 = 1110

C0FF.EE = 1100 0000 1111 1111 1110
1110

Part C

Objective

Convert numbers $base_n$ to $base_n$ showing in detail the conversion process

1. What is the $Base_{16}$ value of 8 bit 2's complement number $1001\ 0101_2$

2*7 128 1
2*6 64 0
2*5 32 0
2*4 16 1
2*3 8 0
2*2 4 1
2*1 2 0
2*0 1 1

decimal = 149

(128*1) + (16*1)+(4*1)+(1*1) = 149*10

16n	number	count	remainder	
16*1	16	9	144	(149%16 == 9.3125 hence 9, 9*16 = 144)
16*0	1	5	0	

95*16

2. Subtract 13_{10} from 42_{10} using 8 bit 2's complement and convert to $Base_8$

13*10 = 0000 1101
42*10 = 0010 1010

Flip:
1111 0010

Add 1:
1111 0010
\+ 1

1111 0011

Add both:

0010 1010
\+ 1111 0011
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1 0001 0101

Part D

Objective

Convert numbers base$_n$ to hexadecimal showing in detail the conversion process

1. Add -32_{10} to 61_{10} using 8 bit 2's complement

61*10 = 0011 1101
-32*10 = 0010 0000

Flip:
0011 1101 = 1100 0010

add 1:
 1100 0010
+ 1

1100 0011

add both:

 0010 0000
+1100 0010

 1110 0010

2. Add -4_{10} to 46_{10} using 8 bit 2's complement

46*10 = 0010 1110
-4*10 = 0000 0100

Flip:
0010 1110 = 1101 0001

add 1:
 1101 0001
+ 1

 1101 0010

add both:

 0000 0100
+1101 0010

 1101 0110

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Hand up this practical report at the end of session and ensure it has been checked

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Date	11/10/2022	**Checked**	
Group	**A / B**		