Chapter - 1 Computer Data Representation

Assignment - 1

Q.1] Convert the following into given number System :-

1] $(45)_{10} = ?()_2$

→

2	45	1
2	22	0
2	11	1
2	5	1
2	2	0
	1 →	1

So, the binary equivalent of $(45)_{10} = (101101)_2$

* Conversion Steps

- Divide number by 2.
- Get integer quotient for next iteration.
- Get remainder for binary digit.
- Repeat the steps until the quotient is equal to 0.
- Then write out remainders in reverse order to get binary digit.

2] $(129)_{10} = ?()_2$

→

2	129	1
2	64	0
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
	1 → 1	

- Same steps as Prob. no 1.
- But the answer of $(129)_{10}$ is $(10000001)_2$.

So, the binary equivalent of $(129)_{10} = (10000001)_2$

3] $(355)_{10} = ?()_8$

→

8	355	3
8	44	4
8	5 → 5	
	0	

∴ Decimal number of $(355)_{10} = (543)_8$

* Conversion Steps

- Divide 355 by 8 keeping notice of quotient and remainder.
- Continue dividing quotient by 8 until you get quotient of zero

- At last write the remainder in reverse order to get Octal number.

4] $(592)_{10} = ?()_{16}$

→

16	592	0
16	37	5
16	2 →	2
	0	

∴ Decimal number of $(592)_{10} = (250)_{16}$

* Conversion Steps

- Divide 592 by 16
- Continue dividing the quotient by 16 until you get a quotient of zero.
- At last, write the remainder order to get hexa-decimal number.

5] $(1545)_{10} = ?()_{16}$

→

16	1545	9
16	96	0
16	6 →	6
	0	

∴ So, the decimal number $(1545)_{10}$ is converted to $(609)_{16}$

* Conversion Steps

- Same Steps as Refer to Q.4
- But the answer of $(1545)_{10} = (609)_{16}$.
- Get the remainder in reverse order to get hexa-decimal digit.

5] $(575)_{10} = ?()_8$

→

8	575	7
8	71	7
8	8	0
8	1 →	1
	0	

∴ So, the decimal number $(575)_{10}$ is converted to $(1077)_8$.

* Conversion Steps

- Same steps as refer to 3.
- But the answer of $(575)_{10} = (1077)_8$.

Q2] Convert the following numbers into decimal number System :

1] $(101010)_2 = (?)_{10}$

→ $(1\times2)^5 + (0\times2)^4 + (1\times2)^3 + (0\times2)^2 + (1\times2)^1 + (0\times2)^0$

→ $32 + 0 + 8 + 0 + 2 + 0$

→ $(42)_{10}$

So, the binary number of $(101010)_2 = (42)_{10}$ of decimal equivalent.

2] $(AB)_{16} = ?()_{10}$

→ Here $A = 10$, $B = 11$ } As per the Hexa-decimal Value.

$= (A\times16^1) + (B\times16^0)$

$= (10\times16^1) + (11\times16^0)$

$= (10\times16) + (11\times1)$

$= 160 + 11$

$= (171)_{10}$

So, the decimal equivalent is $(171)_{10}$.

3] $(75)_8 = ?()_{10}$

$= (7 \times 8^1) + (5 \times 8^0)$

$= (7 \times 8) + (5 \times 1)$

$= 56 + 5$

$= (61)_{10}$

∴ This is the decimal equivalent of Octal number 75.

4] $(11001100)_2 = ?()_{10}$

$= (1 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$.

$= (1 \times 128) + (1 \times 64) + (0 \times 32) + (0 \times 16) + (1 \times 8) + (1 \times 4) + (0 \times 2) + (0 \times 1)$.

$= 128 + 64 + 0 + 0 + 8 + 4 + 0 + 0$

$= (204)_{10}$

∴ The binary digit $(11001100)_2$ has the decimal equivalent = $(204)_{10}$

5] $(1C7)_{16} = ?()_{10}$ {Here, C = 12}

$= (1 \times 16^2) + (12 \times 16^1) + (7 \times 16^0)$

$= (1 \times 256) + (12 \times 16) + (7 \times 1)$

$= 256 + 192 + 7$

$= (455)_{10}$

∴ Decimal equivalent $= (455)_{10}$

6] $(675)_8 = ?()_{10}$.

$= (6 \times 8^2) + (7 \times 8^1) + (5 \times 8^0)$

$= (6 \times 64) + (7 \times 8) + (5 \times 1)$

$= 384 + 56 + 5$

$= (445)_{10}$

∴ Decimal equivalent $= (445)_{10}$

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(Q3] Explain 1's Complement of the number with example.

→ 1's Complement of a number

- To get 1's Complement of a binary number, Simple invert the given number.
- You can Simply implement logic circuit using Binary number input.
- There are Various uses of 1's Complement of Binary number representation and Various arithmetic operations for Binary numbers. Eg. additions, Subtractions, etc.

Example → i] Binary number → $(10101110)_2$
1's Complement → (01010001)

ii] Binary number → $(01110.110)_2$
1's Compl. of Binary no → 10001.001

(Q4) Find the 2's Complement of the following numbers :-

1] 1 0 1 0 1 1 0 1

→

1	0	1	0	1	1	0	1	→ Binary number
0	1	0	1	0	0	1	0	→ 1's Complement
						+	1	→ Add 1
0	1	0	1	0	0	1	1	→ 2's Complement

∴ 2's Complement = $(01010011)_2$

2] 1 1 0 0 1 1 0 1

1	1	0	0	1	1	0	1	→ Binary number
0	0	1	1	0	0	1	0	→ 1's Complement
						+	1	→ Add 1
0	0	1	1	0	0	1	1	→ 2's Complement

∴ Answer is $(00110011)_2$

3] 111100000

→

Carry ←	1	1	1	1	0	0	0	0
	0	0	0	0	1	1	1	1
							+	1
	0	0	0	1	0	0	0	0

→ Binary number
→ 1's Complement
→ Add 1
→ 2's Complement

∴ Answer of 2's Complement = $(00011\underline{0000})_2$

4] 11001100

→

	1	1	0	0	1	1	0	0
	0	0	1	1	0	0	1	1
							+	1
	0	0	1	1	0	1	0	0

→ Binary number
→ 1's Complement
→ Add 1
→ 2's Complement

∴ Answer of 2's Complement is $(00110\underline{100})_2$

5] 10011001

→

	1	0	0	1	1	0	0	1
	0	1	1	0	0	1	1	0
							+	1
	0	1	1	0	0	1	1	1

→ Binary number
→ 1's Complement
→ Add 1
→ 2's Complement

∴ Answer of 2's Complement is $(0110\underline{0111})_2$

Q5] Explain floating-point representation & explain mantissa & exponent term using example.

→ Floating-Point representation

• The floating-Point representation of a number has two parts.

1] It represents a Signed, fixed-point number called mantissa.

2] The second part designates position of decimal (or binary point) and is called the exponent.

The fixed-point mantissa may be fraction or an integer.

Eg. the decimal number +6132.789

Fraction	Exponent
0.6132789	+04

The value of exponent indicates that the actual position of decimal point is four positions to right of indicated decimal point in fraction.

The equivalent is $+0.6132789 \times 10^{4}$

The floating - point is represented as

$$f = m \times a^{e}$$

Solve the following examples using 10's Complement

125 - 35

A = (125)10
B = (35)10

Take 10's Complement of B

```
  99
- 35
  64
+  1
  65
```

Add as 10's Complement of B.

```
  125
+  65
 1 90
```

Carry

- Carry is generated so answer is positive and ignore Carry.

(125)10 - (35)10 = (90)10

3] 257 - 625

A = $(257)_{10}$

B = $(625)_{10}$

Take 10's Complement of B

```
  999
- 625
  374
+   1
  375
```

Add in 10's Complement of B

```
  257
+ 375
  632  result
```

Take 10's of result

```
  999
- 632
  367
+   1
  368  final result.
```

∴ Carry is not generated So answer is negative

$(257)_{10} - (625)_{10} = (-368)_{10}$

4] 700 − 100

A = (700)10
B = (100)10

Take 10's Complement of B

```
  999
  100
  899
+   1
  900
```

Add to 10's Complement of B

```
  700
+ 900
 1600
```

(Carry)

- Carry is generated so answer is Positive and ignore the Carry.

(700)10 − (100)10 = (600)10

5] 850 - 1000

A = (850)10
B = (1000)10

Take 10's complement of B

```
  9999
- 1000
  8999
+    1
  9000
```

Add in 10's complement of B.

```
   850
+ 9000
 (1)850  result
carry
```

Take 10's complement of last 3-digit of result.

```
  999
  850
  149
+   1
  150
```

Carry is not generated so result is negative
(850)10 - (1000)10 = (150)10