Chapter 2 Number Systems

I. Choose The Correct Answer

Question 1.
Which refers to the number of bits processed by a computer's CPU?
(a) Byte
(b) Nibble
(c) Word length
(d) Bit
Answer:
(c) Word length

Question 2.
How many bytes does 1 KiloByte contain?
(a) 1000
(b) 8
(c) 4
(d) 1024
Answer:
(d) 1024

Question 3.
Expansion for ASCII:
(a) American School Code for Information Interchange
(b) American Standard Code for Information Interchange
(c) All Standard Code for Information Interchange
(d) American Society Code for Information Interchange
Answer:
(b) American Standard Code for Information Interchange

Question 4.
2^50 is referred as:
(a) kilo
(b) tera
(c) peta
(d) zetta
Answer:
(c) peta

Question 5.
How many characters can be handled in Binary Coded Decimal System?
(a) 64
(b) 255
(c) 256
(d) 128
Answer:
(a) 64

Question 6.
For 11012 what is the Hexadecimal equivalent?
(a) F
(b) E
(c) D
(d) B
Answer:
(c) D

Question 7.
What is the 1 ‘s complement of 00100110?
(a) 00100110
(b) 11011001
(c) 11010001
(d) 00101001
Answer:
(b) 11011001

Question 8.
Which amongst this is not an Octal number?
(a) 645
(b) 234
(c) 876
(d) 123
Answer:
(c) 876

PART - II

II. Short Answers

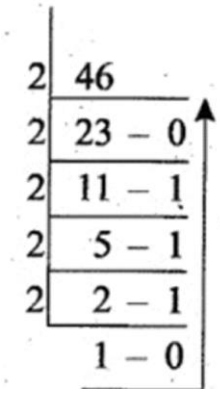
Question 1.
What is data?
Answer:
The term data comes from the word datum, which means a raw fact. The data is a fact about people, places or some objects.

Eg: Let ‘Name’, ‘Age’, ‘Class’, ‘Marks’ and ‘Subject’ be some defined variables. Now, let us assign a value to each of these variables.
Name = Rajesh
Age = 16
Class = XI
Mark – 65
Subject = Computer Science
In the above example, the values assigned to the five different variables are called data.

Question 2.
Write the l’s complement procedure?
Answer:

1. Step 1: Convert given Decimal number into Binary
2. Step 2: Check if the binary number contains 8 bits, if less add 0 at the left most bit, to make it as 8 bits.
3. Step 3: Invert all bits (i.e. Change 1 as 0 and 0 as 1)

Question 3.
Convert $(46)_{10}$ into Binary number?



$(46)_{10} = (101110)_2$

Question 4.
We cannot find 1’s complement for (28)10. State reason?
Answer:
1’s complement representation is an easier approach to represent signed numbers. This is for negative numbers only. This (28)10 this whole numbers cannot be determined by negative number because the number whose MSB is 1.

Question 5.
List the encoding systems for characters immemory?
Answer:
There are several encoding systems used for computer. They are

1. BCD: Binary Coded Decimal.
2. EBCDIC: Extended Binary Coded Decimal Interchange Code.
3. ASCII: American Standard Code for Information Interchange.
4. Unicode

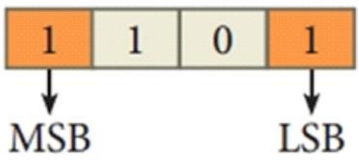
5. ISCII: Indian Standard Code for Information Interchange.

PART - III

III. Explain in Brief

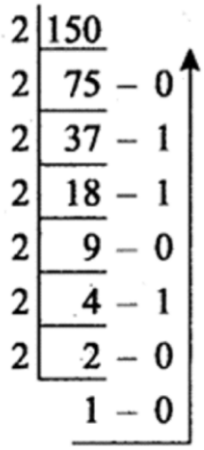
Question 1.
What is radix of a number system? Give example?
Answer:
A numbering system is a way of representing numbers. The most commonly used numbering system in real life is Decimal number system. Other number systems are Binary, Octal, Hexadecimal number system. Each number system is uniquely identified by its base value or radix. Radix or base is the count of number of digits in each number system. Radix or base is the general idea behind positional numbering system.
Eg: $(123)_{10}$, $(547)_{8}$, $(1001)_{2}$, $(25)_{16}$.

Question 2.
Write note on binary number system?
Answer:
There are only two digits in the Binary system, namely, 0 and 1. The numbers in the binary system are represented to the base 2 and the positional multipliers are the powers of 2. The left most bit in the binary number is called as the Most Significant Bit (MSB) and it has the largest positional weight. The right most bit is the Least Significant Bit (LSB) and has the smallest positional weight.



Eg: The binary sequence $(1101)_2$ has the decimal equivalent:
$(1101)_2 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
$= 8 + 4 + 0 + 1 = (13)_{10}$

Question 3.
Convert $(150)_{10}$ into Binary, then convert that Binary number to Octal?
Binary number:



$(150)_{10} = (10010110)_2$

Binary number to octal:

$\underbrace{010}_{2}\ \underbrace{010}_{2}\ \underbrace{110}_{6}$

$(010010110)_{10} = (226)_8$

Question 4.
Write short note on ISCII?
Answer:
ISCII is the system of handling the character of Indian local languages. This as a 8-bit coding system. Therefore it can handle 256 (2s) characters. This system is formulated by the department of Electronics in India in the year 1986-88 and recognized by Bureau of Indian Standards (BIS). Now this coding system is integrated with Unicode.

The supported scripts are:
Assamese, Bengali (Bangla), Devanagari, Gujarati, Gurmukhi, Kannada, Malayalam, Oriya, Tamil, and Telugu. ISCII does not encode the writing systems of India based on Arabic, but its writing system switching codes none the less provide for Kashmiri, Sindhi, Urdu, Persian, Pashto and Arabic. The Arabic – based writing systems were subsequently encoded in the PASCII encoding.

ISCII is an 8 – bit encoding. The lower 128 code points are plain ASCII, the upper 128 code points are ISCII – specific. In addition to the code points representing characters, ISCII makes use of a code point with mnemonic ATR that indicates that the following byte contains one of two kinds of information. One set of values changes the writing system until the next writing system indicator or end – of – line.

Question 5.
Add:
(i)-22_{10}+15_{10}
(ii) 20_{10}+ 25_{10}

Add (a) – 22_{10} + 15_{10}
(b) 20_{10} + 25_{10}

–22

2	22	
2	11	– 0
2	5	– 1
2	2	– 1
	1	– 0

Answer:
(a) – 2210 = 10110_2
Binary Equivalent = 10110_2

8 bit	=	00010110
1's complement	=	11101001 (+)
Add 1	=	1
		11101010
(15_{10}) = 1111		
8 bit	=	00001111
$-22_{10} + 15_{10}$	=	11101010 (+)
		00001111
		11111001

Answer:
11111001_2

(b) $20_{10} + 25_{10}$
Answer:

$20_{10} + 25_{10}$

2	20		2	25	
2	10	– 0	2	12	– 1
2	5	– 0	2	6	– 0
2	2	– 1	2	3	– 0
	1	– 0		1	– 1

$20_{10} = 10100$ $25_{10} = 11001$

8 bit $= 00010100_2$ 8 bit $0001\ 1001_2$

$20_{10} + 25_{10} =$ 0001 0100 (+)

0001 1001

0010 1101

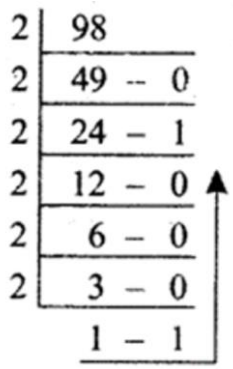
Answer:
00101101_2

PART - IV

IV. Explain in detail.

Question 1.
(a) Write the procedure to convert fractional Decimal to Binary.
(b) Convert (98.46)10 to Binary.
Answer:
(a) The method of repeated multiplication by 2 has to be used to convert such kind of decimal fractions.
The steps involved in the method of repeated multiplication by 2:

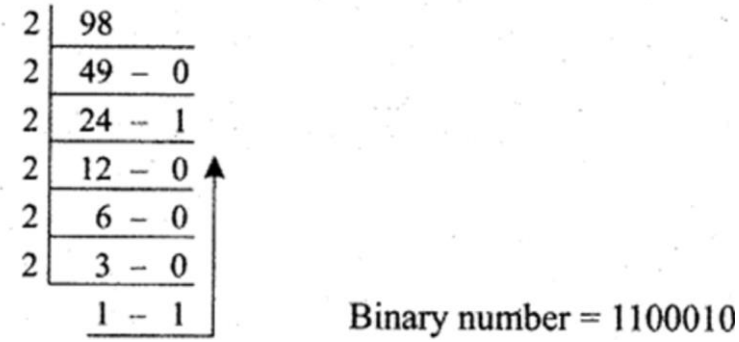
Step 1: Multiply the decimal fraction by 2 and note the integer part. The integer part is either 0 or 1.
Step 2: Discard, the integer part of the previous product. Multiply the fractional part of the previous product by 2 Repeat Step 1 until the same fraction repeats or terminates (0).
Step 3: The resulting integer part forms a sequence of Os and Is that become the binary equivalent of decimal fraction.
Step 4: The final answer is to be written from first integer part obtained till the last integer part obtained.



multiplication	Integer	Fraction
.46 × 2 = 0.92	0	.92
.92 × 2 = 1.84	1	.84
.84 × 2 = 1.68	1	.68
.68 × 2 = 1.36	1	.36
.36 × 2 = 0.72	0	.72
.72 × 2 = 1.44	1	.44
.44 × 2 = 0.88	0	.88
.88 × 2 = 1.76	1	.76
.76 × 2 = 1.52	1	.52

$(98.46)_{10}$ = $(1100010.011101011.....)_2$

Question 2.
Find 1's Complement and 2's Complement for the following Decimal number:
(a) – 98
(b) -135
(a) – 98
First convert given decimal number into binary:



Binary number = 1100010
Binary number = 1100010
Second, check binary number as 8 bits, If less add 0 as the left most bit, 01100010
Third, Invert all bits (change 1 as 0 and 0 as 1)
1's complement for 10011101.

2's complement:

Binary equivalent of + 98	=	1100010
8 bit format	=	01100010
1's complement	=	10011101
Add 1 to LSB	=	1
		10011110

(b) – 135

First convert gives decimal number into Binary.

2	135	
2	67 –	1
2	33 –	1
2	16 –	1
2	8 –	0
2	4 –	0
2	2 –	0
	1 –	0

Binary number = 10000111

Binary number = 10000111

Second, check binary number as 8 bits, If less add 0 at the left most bit. It has 8 bits, 10000111.

Third, Invert all bits (change 1 as 0 and 0 as 1)

1 's complement for 01111000.

2's complement:

Binary equivalent of + 135	=	10000111
8 bit format	=	10000111
1's complement	=	01111000
Add 1 to LSB	=	1
		01111001

2's complement of – 135 – 01111001

Question 3.
(a) Add 1101010_2+ 101101_2
(b) Subtract 1101011_2 – 1110102_2
Answer:
(a) 1101010_2 + 101101_2

$$\begin{array}{rr} & 1101010 \\ (+) & 101101 \\ \hline & 10010111 \\ \hline \end{array} \quad 1 + 1 = 10$$

1101010_2 + 101101_2 = 10010111_2
(b) 1101011_2 – 111010_2

$$\begin{array}{rr} & 1101011 \\ (-) & 111010 \\ \hline & 110001 \\ \hline \end{array}$$

1101011_2 – 111010_2 = 110001_2

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