12th Standard	Syllabus	Books	Study Materials – EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	PTA Book Q&A	Centum Questions	Creative Questions
	Quarterly Exam	Half Yearly Exam	Public Exam	NEET		

11th Standard	Syllabus	Books	Study Materials – EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	Centum Questions	Creative Questions	
	Quarterly Exam	Half Yearly Exam	Public Exam	NEET		

10th Standard	Syllabus	Books	Study Materials - EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	PTA Book Q&A	Centum Questions	Creative Questions
	Quarterly Exam	Half Yearly Exam	Public Exam	NTSE	SLAS	

9th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Quarterly Exam	Half Yearly Exam	Annual Exam	RTE		

8th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Public Model Q&A	NMMS	Periodical Test

7th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

6th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

1st to 5th Standard	Syllabus	Books	Study Materials	Periodical Test	SLAS	
	Term 1	Term 2	Term 3	Public Model Q&A		

Exams	TET	TNPSC	PGTRB	Polytechnic	Police	Computer Instructor
	DEO	BEO	LAB Asst	NMMS	RTE	NTSE

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HIGHER SECONDARY FIRST YEAR
Unit – I Fundamentals of Computers :: Chapter – II Number Systems
Evaluation Questions
Part I
I. Choose the best answer

1. Which refers to the number of bits processed by a computer's CPU? **Word length**.
2. How many bytes does 1 KiloByte contain? **1024**
3. Expansion for ASCII. **American Standard Code for Information Interchange**
4. 2^50 is referred as. **Peta.**
5. How many characters can be handled in Binary Coded Decimal System? **64**
6. For 11012 what is the Hexadecimal equivalent? **D**
7. What is the 1's complement of 00100110? **11011001**
8. Which amongst this is not an Octal number? **876**

II. Very Short Answers

1. What is data?
   - The term data comes from the word datum, which means a raw fact.
   - The data is a fact about people, places or some objects.
   - Computer handles data in the form of '0'(Zero) and '1' (One).
2. Write the 1's complement procedure.
   Step 1: Convert given Decimal number into Binary.
   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.
   Step 3: Invert all bits (i.e. Change 1 as 0 and 0 as 1)
3. Convert $(46)_{10}$ into Binary number.

```
2 | 46
2 | 23 - 0
2 | 11 - 1
2 | 5  - 1
2 | 2  - 1
  | 1  - 0
```

$46_{10} = 101110_2$

4. We cannot find 1's complement for $(28)_{10}$. State reason.
   We cannot find 1's complement for $(28)_{10}$. Because it is a positive number.
   1's complement apply only with negative number.
5. List the encoding systems for characters in memory.

Several encoding systems used for computer.

- BCD – Binary Coded Decimal
- EBCDIC – Extended Binary Coded Decimal Interchange Code
- ASCII – American Standard Code for Information Interchange
- Unicode
- ISCII - Indian Standard Code for Information Interchange

III. Short Answers

1. What is radix of a number system? Give example
   - A numbering system is a way of representing numbers.
   - The most commonly used numbering system in real life is Decimal number system, others 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.
     - Decimal Number System - Radix or base 10 – $(150)_{10}$
     - Binary Number System - Radix or base 2 – $(101110)_2$

- Octal Number System - Radix or base 8 – $(226)_8$
- Hexadecimal Number System - Radix or base 16 – $(7E)_{16}$.

2. Write note on binary number system.
   - 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.
   - Example 1101_2 .
3. Convert $(150)_{10}$ into Binary, then convert that Binary number to Octal

Decimal to Binary conversion

```
2 | 150
2 | 75  - 0
2 | 37  - 1
2 | 18  - 1
2 | 9   - 0
2 | 4   - 1
2 | 2   - 0
    1   - 0
```

$150_{10} = 10010110_2$

Binary to Octal conversion

Group 3 bit format 010 010 110

↓ ↓ ↓

2 2 6

$010\ 010\ 110_2 = 226_8$

Octal	Binary Equivalent
0	000
1	001
2	**010**
3	011
4	100
5	101
6	**110**
7	111

4. Write short note on ISCII
   - Indian Standard Code for Information Interchange (ISCII) is the system of handling the character of Indian local languages.
   - This as a 8-bit coding system. Therefore it can handle 256 (28) 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.

5. Add a) $-22_{10}+15_{10}$ b) $20_{10}+25_{10}$

   a) $-22_{10}+15_{10}$

Binary equivalent of 22	10110
8 bit format	00010110
1's Complement	11101001
Add 1 to LSB	1
2's Complement	**11101010**
Binary equivalent of 15	1111
8 bit format	**00001111**
Binary addition of -22 and 15	11101010
	00001111
	11111001

```
   2 | 22
   2 | 11 - 0 LSB
   2 | 5  - 1
   2 | 2  - 1
MSB  | 1  - 0

     | 15
   2 | 7 – 1 LSB
   2 | 3 - 1
MSB  | 1 - 1

11101001
       1 +
--------
11101010

11101010
00001111 +
--------
11111001
```

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

Binary equivalent of 20	10100
8 bit format	**00010100**
Binary equivalent of 25	11001
8 bit format	**00011001**
Binary addition of 20 and 25	00010100
	00011001
	00101101

```
  2|20                   |25
  2|10 - 0 LSB ↑        2|12 – 1LSB ↑
  2|5  - 0              2|6  - 0
  2|2  - 1              2|3  - 0
MSB|1  - 0            MSB|1  - 1

00010100
00011001  +
00101101
```

IV. Short Answers

1. A) Write the procedure to convert fractional Decimal to Binary.

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 0s and 1s 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.

B) Convert $(98.46)_{10}$ to Binary.

i) Integer Part conversion

```
  2|98
  2|49 -0 LSB ↑
  2|24 - 1
  2|12 - 0
  2| 6 - 0
  2| 3 - 0
MSB| 1 - 1
```

$98_2=1100010_2$

ii) Fractional part conversion

0.46 X 2 = 0.92 = 0 ↓
0.92 X 2 = 1.84 = 1
0.84 X 2 = 1.68 = 1
0.68 X 2 = 1.36 = 1
0.36 X 2 = 0.72 = 0
0.72 X 2 = 1.44 = 1
0.44 X 2 = 0.88 = 0 ↓

$0.46_{10} = 0111010_2$

$98.46_{10} = 1100010.0111010_2$

2. Find 1's Complement and 2's Complement for the following Decimal number

A) -98 B) -135

A) -98

Binary equivalent of 98	1110110
8 bit format	01110110
1's Complement	**10001001**
Add 1 to LSB	1
2's Complement	**10001010**

```
  2|98
  2|49 - 0 LSB ↑
  2|29 - 1
  2|14 - 1
  2| 7 - 0
  2| 3 - 1
MSB| 1 - 1
```

B) -135

Binary equivalent of 135	10000111
1's Complement	**01111000**
Add 1 to LSB	1
2's Complement	**01111001**

	2	135
	2	67 - 1 LSB
	2	33 - 1
	2	16 - 1
	2	8 - 0
	2	4 - 0
	2	2 - 0
MSB		1 - 0

3) A) Add $1101010_2 + 101101_2$ B) Subtract $1101011_2 - 111010_2$

A)
```
 1101010 +
  101101
--------
10110111
```

$1101010_2 + 101101_2 = 10110111_2$

B)
```
1101011 -
 111010
-------
 100001
```

$1101011_2 – 111010_2 = 110001_2$

0+1=1
1+0=1
1+1=10
1+1+1=11

1-0=0
1-1=0
10-1=1

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HIGHER SECONDARY FIRST YEAR

Unit – I Fundamentals of Computers :: Chapter – II Number Systems – One Marks

1. The term data comes from the word **datum**, which means a raw fact.
2. The data is a fact about **people, places or some objects**.
3. Computer only handles data in the form of **'0'(Zero) and '1' (One)**.
4. '0' or '1' are called **Bi**nary Digi**ts**(BIT).
5. Binary Digit(BIT) is the basic unit of data in computers.
6. **Bit** is the basic unit of data in computers.
7. A collection of 4 bits is called **nibble**.
8. A collection of 8 bits is called **Byte.**
9. A byte is considered as the basic unit of **measuring the memory size** in the computer.
10. The number of bits processed by a Computer's CPU refers to **Word length**.
11. A word length can have **8 bits, 16 bits, 32 bits and 64 bits**. Present day Computers use **32 bits or 64 bits**.
12. 1 KiloByte represents **1024 bytes** that is 2^10.
13. 1 MegaByte represents **1024 KiloByte** that is 2^20.
14. 1 GigaByte represents **1024 MegaByte** that is 2^30.
15. 1 TeraByte represents **1024 GigaByte** that is 2^40.
16. 1 PetaByte represents **1024 TeraByte** that is 2^50.
17. 1 ExaByte represents **1024 PetaByte** that is 2^60.
18. 1 ZettaByte represents **1024 ExaByte** that is 2^70.
19. 1 YottaByte represents **1024 ZettaByte** that is 2^80.
20. The most commonly used coding scheme is **the American Standard Code for Information Interchange (ASCII).**
21. The range of ASCII values for **lower case alphabets** is from **97 to 122** and
22. The range of ASCII values for **the upper case alphabets** is **65 to 90**.
23. Number systems are **Decimal, Binary, Octal, Hexadecimal** number system.
24. Each number system is uniquely identified by its **base value or radix**.
25. Decimal Number System consists of **0,1,2,3,4,5,6,7,8,9(base 10)**.
26. There are only two digits in the Binary system **0 and 1** (base 2).
27. The left most bit in the binary number is called as the **Most Significant Bit (MSB)** and it has the largest positional weight.
28. The right most bit is the **Least Significant Bit (LSB)** and has the smallest positional weight.
29. Octal number system digits are **0,1,2,3,4,5,6 and 7** (base 8).
30. A hexadecimal number is represented using base 16 (0 to 9, A to F).
31. To convert Decimal to Binary **"Repeated Division by 2"** method can be used.
32. To convert Decimal to Octal **"Repeated Division by 8"** method can be used.
33. To convert Decimal to Hexadecimal "**Repeated division by 16**" method can be used.
34. ISCII 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.**
35. Unicode was generated to handle all the coding system of **Universal languages**.
36. Unicode is 16 bit code and can handle **65536** characters.
37. Unicode scheme is denoted by **hexadecimal numbers**.

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HIGHER SECONDARY FIRST YEAR
Unit – I Fundamentals of Computers :: Chapter – II Number Systems
Workshop Questions

1. Identify the number system for the following numbers

S.No	Number	Number System
1	(1010)10	here the base is 10 so Decimal Number System
2	(1010)2	here the base is 2 so Binary Number System
3	(989)16	here the base is 16 so Hexadecimal Number System
4	(750)8	here the base is 8 so Octal Number System
5	(926)10	Here the base is 10 so Decimal Number System

2. State whether the following numbers are valid or not. If invalid, give reason.

S.No	Statement	Yes / No	Reason (If invalid)
1.	786 is an Octal number	No	Octal Numbers 0 to 7 (base 8) here 2nd digit 8 not correct
2.	101 is a Binary number	Yes	Binary numbers 0 and 1 (base 2)
3.	Radix of Octal number is 7	No	Radix and Base same meaning. Octal number 0 to 7, so Radix 7 is not correct.

3. Convert the following Decimal numbers to its equivalent Binary, Octal, Hexadecimal.
   A) 1920 B) 255 C)126

A) Decimal to Binary

```
2|1920
2| 960 - 0 LSB
2| 480 - 0
2| 240 - 0
2| 120 - 0
2|  60 - 0
2|  30 - 0
2|  15 - 0
2|   7 - 1
2|   3 - 1
MSB  1 - 1
```

$1920_{10} = 11110000000_2$

Decimal to Octal

```
8|1920
8| 240 - 0 LSB
8|  30 - 0
MSB  3 – 6
```

$1920_{10} = 3600_8$

Decimal to Hexadecimal

```
16|1920
16| 120 - 0 LSB
MSB   7 - 8
```

$1920_{10} = 780_{16}$

B) 255 Decimal to Binary

```
2|255
2|127 - 1 LSB
2| 63 - 1
2| 31 - 1
2| 15 - 1
2|  7 - 1
2|  3 - 1
MSB 1 - 1
```

$255_{10} = 11111111_2$

Decimal to Octal

```
8|255
8| 31 - 7 LSB
MSB 3 - 7
```

$255_{10} = 377_8$

Decimal to Hexadecimal

```
16|255
MSB  15 - 15 LSB
```

$255_{10} = FF_{16}$

C) Decimal to Binary | Decimal to Octal | Decimal to Hexadecimal

```
2|126
2| 63 - 0   LSB
2| 31 - 1
2| 15 - 1
2|  7 - 1
2|  3 - 1
MSB  1 - 1
```

$126_{10} = 1111110_2$

```
8|126
8| 15 - 6   LSB
MSB  1 - 7
```

$126_{10} = 176_8$

```
16|126
MSB  7 - 14   LSB
```

$126_{10} = 7E_{16}$

***** Understand these tables for easy conversion**

Octal to Binary equivalent

Octal	**Binary Equivalent**
0	**000**
1	**001**
2	**010**
3	**011**
4	**100**
5	**101**
6	**110**
7	**111**

Hexadecimal to Binary Equivalent

Hexadecimal	**Binary Equivalent**	**Hexadecimal**	**Binary Equivalent**
0	**0000**	**8**	**1000**
1	**0001**	**9**	**1001**
2	**0010**	**A**	**1010**
3	**0011**	**B**	**1011**
4	**0100**	**C**	**1100**
5	**0101**	**D**	**1101**
6	**0110**	**E**	**1110**
7	**0111**	**F**	**1111**

4. Convert the following Binary numbers to its equivalent Decimal, Octal, Hexadecimal.
   a) 101110101 b) 1011010 c)101011111

a) 101110101 **Binary to Decimal conversion**

$= (1 X 2^8) + (0 X 2^7) + (1 X 2^6) + (1 X 2^5) + (1 X 2^4) + (0 X 2^3) + (1 X 2^2) + (0 X 2^1) + (1 X 2^0)$

$= 256 + 0 + 64 + 32 + 16 + 0 + 4 + 0 + 1$

$= 373$

$101110101_2 = 373_{10}$

Binary to Octal Conversion

```
101 110 101
 ↓   ↓   ↓
 5   6   5
```

$101110101_2 = 565_8$

Binary to Hexadecimal conversion

```
0001 0111 0101
 ↓    ↓    ↓
 1    7    5
```

$1011010_{12} = 175_{16}$

b) 1011010 **Binary to Decimal conversion**

$= (1 X 2^6) + (0 X 2^5) + (1 X 2^4) + (1 X 2^3) + (0 X 2^2) + (1 X 2^1) + (0 X 2^0)$

$= 64 + 0 + 16 + 8 + 0 + 2 + 0$

$= 90$

$1011010_2 = 90_{10}$

Binary to Octal Conversion

001 011 010
↓ ↓ ↓
1 3 2

$1011010_2 = 132_8$

Binary to Hexadecimal conversion

0101 1010
↓ ↓
5 A

$1011010_2 = 5A_{16}$

c)101011111

Binary to Decimal conversion

$= (1 X 2^8) + (0 X 2^7) + (1 X 2^6) + (0 X 2^5) + (1 X 2^4) + (1 X 2^3) + (1 X 2^2) + (1 X 2^1) + (1 X 2^0)$

$= 256 + 0 + 64 + 0 + 16 + 8 + 4 + 2 + 1$

$= 351$

$101011111_2 = 351_{10}$

Binary to Octal Conversion

101 011 111
↓ ↓ ↓
5 3 7

$101011111_2 = 537_8$

Binary to Hexadecimal conversion

0001 0101 1111
↓ ↓ ↓
1 5 F

$101011111_2 = 15F_{16}$

5. Convert the following Octal numbers into Binary numbers. (A) 472 (B) 145 (C) 347 (D) 6247 (E) 645

Use this table for easy conversion

Octal	Binary Equivalent
0	**000**
1	**001**
2	**010**
3	**011**
4	**100**
5	**101**
6	**110**
7	**111**

A) 472_8

4 7 2
↓ ↓ ↓
100 111 010

$472_8 = 100111010_2$

B) 145_8

1 4 5
↓ ↓ ↓
001 100 101

$145_8 = 001100101_2$

C) 347_8

3 4 7
↓ ↓ ↓
011 100 111

$347_8 = 011100111_2$

D) 6247_8

6 2 4 7
↓ ↓ ↓ ↓
110 010 100 111

$6247_8 = 110010100111_2$

E) 645_8

6 4 5
↓ ↓ ↓
110 100 101

$645_8 = 110100101_2$

6. Convert the following Hexadecimal numbers to Binary numbers (A) A6 (B)BE (C)9BC8 (D) BC9

Hexadecimal to Binary Equivalent

Hexadecimal	Binary Equivalent	Hexadecimal	Binary Equivalent
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

(A) $A6_{16}$
A → 1010, 6 → 0110
$A6_{16} = 10100110_2$

(B) BE_{16}
B → 1011, E → 1110
$BE_{16} = 10111110_2$

(C) $9BC8_{16}$
9 → 1001, B → 1011, C → 1100, 8 → 1000
$9BC8_{16} = 1001101111001000_2$

(D) $BC9_{16}$
B → 1011, C → 1100, 9 → 1001
$BC9_{16} = 101111001001_2$

7. Write the 1's complement number and 2's complement number for the following decimal numbers: (A) 22 (B) -13 (C) -65 (D) -46

(A) 22

We cannot find 1's complement for $(22)_{10}$. Because it is a positive number. 1's complement apply only with negative number.

(B) -13

Binary equivalent of 13	1101
8 bit format	00001101
1's Complement	11110010
Add 1 to LSB	1
2's Complement	11110011

(C) -65

Binary equivalent of 65	1000001
8 bit format	01000001
1's Complement	10111110
Add 1 to LSB	1
2's Complement	10111111

(D) -46

Binary equivalent of 46	101110
8 bit format	00101110
1's Complement	11010001
Add 1 to LSB	1
2's Complement	11010010

8. Perform the following binary computations: (A) $10_{10} + 15_{10}$ (B) $-12_{10} + 5_{10}$ (C) $14_{10} - 12_{10}$

(A) $10_{10} + 15_{10}$

Binary equivalent of 10 = 1010
Binary equivalent of 15 = 1111

Binary addition of 10_{10} and $15_{10} = 11001_2$

```
2| 10
2|  5 - 0 LSB
2|  2 - 1
MSB 1 - 0

 | 15
2| 7 – 1LSB
2| 3 - 1
MSB 1 - 1

 1010 +
 1111
-------
11001
```

(B) $-12_{10} + 5_{10}$

Binary equivalent of 12	1100
8 bit format	00001100
1's Complement	11110011
Add 1 to LSB	1
2's Complement	**11110100**
Binary equivalent of 5	101
8 bit format	**0000 0101**
Binary addition of $-12_{10} + 5_{10}$	11111001_2

2|12
2| 6 - 0 LSB
2| 3 - 0
MSB 1 - 1

2|5
2|2 - 1LSB
MSB |1 - 0

11110100 +
00000101
11111001

(C) $14_{10} - 12_{10}$

Binary equivalent of 14	1110
8 bit format	**00001110**
Binary equivalent of -12	1100
8 bit format	00001100
1's Complement	11110011
Add 1 to LSB	1
2's Complement	**11110100**
Binary addition of 14_{10} and -12_{10}	$\mathbf{100000010_2}$

2|14
2| 7 - 0 LSB
2| 3 - 1
MSB 1 - 1

2|12
2| 6 – 0 LSB
2| 3 - 0
MSB 1 - 1

00001110 +
11110100
100000010

(D) $(-2_{10}) - (-6_{10})$

Binary equivalent of 2	10
8 bit format	00000010
1's complement	11111101
Add 1 to LSB	1
2's Complement	**11111110**
Binary equivalent of 6	110
8 bit format	00000110
1's complement	11111001
Add 1 to LSB	1
2's Complement of -2	**11111010**
Binary subtraction of -2_{10} and -6_{10}	00000100

2|2
MSB 1 - 0 LSB

2 | 6
2 | 3 - 0 LSB
MSB 1 – 1

11111110 -
11111010
00000100

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