

# (B) (i) Converting binary to decimal 4

FEBRUARY 2024  
M T W T F S S M T W T F S S  
1 2 3 4 5 6 7 8 9 10 11  
12 13 14 15 16 17 18 19 20 21 22 23 24 25  
26 27 28 29

2024  
Monday

JANUARY

15

Convert binary Number  $10.10001$  into decimal Number

Integer Part  $10 = 1 \times 2^1 + 0 \times 2^0 = 2$

Fraction Part  $.10001 = 1 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 0 \times 2^{-4} + 1 \times 2^{-5}$

$$= \frac{1}{2} + 0 + 0 + 0 + \frac{1}{32}$$

$$= 0.5 + 0.03125 = 0.53125$$

Therefore,  $10.10001_2 = 2.53125_{10}$

## (ii) Converting binary to decimal:

we use binary triplet method. If we proceed as following:

(a) Start from LSB or binary point, arrange the binary numbers as a group of three bits. If triplet is not formed at the MSB side then add one/two zeros to the left of MSB and complete triplet. If in fractional part triplet is not complete then add zero to the right of fractional number. For example, we take the binary numbers

$$10101.11_2 \quad \text{Binary points start}$$

$$010101 \quad .110$$

As triplet was not complete so we have put a zero to the left of MSB

To right of fractional No, we have put a zero to complete the triplet.

So we shall write the numbers as

$$010 \quad 101 \quad .110$$

(b) Now write equivalent octal No. below the triplet

$$010 \quad 101 \quad .110$$

$$\downarrow$$

2

$$\downarrow$$

5

$$\downarrow$$

6

equivalent octal No below triplet

Therefore

$$10101.11_2 = 25.6_8$$



### (iii) Converting binary to hexadecimal:

2024  
Tuesday  
16  
JANUARY

2024							JANUARY						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31											

- (a) First form group of 4 bits of the given binary no. starting from binary point or LBS.
- (b) Complete group of 4 bits by adding zero to the left of MSB or to the right of the fractional part, if required.
- (c) Write below 4-group bit its equivalent hexadecimal numbers.

For example, we take the binary numbers

$$(1110101111)_2$$

Binary number in a group of four

Start from LSB

0011

1010

1111

(Two zeros added to the left of MSB to complete a group of 4)

Hexadecimal equivalent  $\rightarrow$  3

A

F

$$\text{So } (1110101111)_2 = (3AF)_{16}$$

### (i) Converting Octal to decimal

We convert  $(1234)_8$  to its equivalent decimal number

$$\begin{aligned}(1234)_8 &= 1 \times 8^3 + 2 \times 8^2 + 3 \times 8^1 + 4 \times 8^0 \\ &= 512 + 128 + 24 + 4 = (668)_{10}\end{aligned}$$

### (ii) Converting Octal to binary

We take the following steps:

- (a) Convert each digit of the given octal number into its 3-bit binary equivalent starting from LSB or binary point.



(b) Write these equivalent binary numbers adjacent to each other to get final equivalent binary numbers.

Let us convert the octal numbers  $(5431)_8$  into equivalent binary numbers then

Copy the Octal Number  $\rightarrow 5 \quad 4 \quad 3 \quad 1$   
 Convert each into 3-bit binary  $\rightarrow 101 \quad 100 \quad 011 \quad 001$   
 Therefore  $(5431)_8 = (101100011001)_2$

(iii) Converting Octal to hexadecimal:

- (a) Convert given octal no. into binary numbers [see (ii)] by forming a group of 3-bit starting from LSB.
- (b) Convert thus obtained binary number into hexadecimal numbers [see B(iii)] by forming group of 4 bit starting from LSB.

Let us convert the octal numbers  $(5431)_8$  into equivalent hexadecimal numbers.

Copy Octal Number  $\rightarrow 5 \quad 4 \quad 3 \quad 1$   
 Convert into binary  $\rightarrow 101 \quad 100 \quad 011 \quad 001$   
 Write the binary numbers  $\rightarrow (101100011001)_2$   
 Now group them as 4-bits starting from LSB  $\rightarrow 1011 \quad 0001 \quad 1001$   
 Write equivalent hexadecimal numbers under each group  $\rightarrow B \quad 1 \quad 9$



## D(i) Converting hexadecimal to decimal

18

2024

Thursday

JANUARY

2024

JANUARY

MTWTFSSMTWTFSS

1 2 3 4 5 6 7 8 9 10 11 12 13 14

15 16 17 18 19 20 21 22 23 24 25 26 27 28

29 30 31

We convert hexadecimal number  $(AB31)_{16}$  into its equivalent decimal number.

$$\begin{aligned}(AB31)_{16} &= (A \times 16^3 + B \times 16^2 + 3 \times 16^1 + 1 \times 16^0)_{10} \\ &= 10 \times 16^3 + 11 \times 16^2 + 3 \times 16^1 + 1 \times 16^0 \\ &= 10 \times 4096 + 11 \times 256 + 3 \times 16 + 1 \times 16^0 \\ &= 40960 + 2816 + 48 + 1 \\ &= (43825)_{10}\end{aligned}$$

## D(ii) Converting hexadecimal to binary

We convert  $(AB31)_{16}$  into its equivalent binary number.

Copy hexadecimal numbers A B 3 1  
Convert each hex digit into equivalent 4-bit binary

1010 1011 0011 0001

Place binary numbers adjacent to each other in a line. The number obtained is equivalent binary number  $(1010101100110001)_2$

## D(iii) Converting hexadecimal to Octal

We convert  $(AB31)_{16}$  into its equivalent octal number.

(a) Copy the hex number  
(b) Write equivalent binary no.  
(c) Write them adjacent to each other

A B 3 1  
1010 1011 0011 0001

(d) Now group into 3 bit no starting at LBS. Complete group  $\rightarrow$  001 010 101 100 110 001  
if required by placing one/two zero to the left of MSB

$(1010101100110001)_2$



(e) write below each 3-bit group its octal equivalent  
 Therefore,  $(AB31)_{16} = (125461)_8$

Ex-1 Convert FACE<sub>16</sub> to binary.  
 Given F A C E  
 Convert each digit 1111 1010 1100 1110  
 Solution is (1111101011001110)<sub>2</sub>

Ex-2 Convert AB<sub>9</sub> to binary.  
 Given A B  
 Convert each digit 1010 1011  
 Solution is (1101010110010)<sub>2</sub>

Ex-3 Convert 11010010 to hexadecimal.  
 Group in fours 1101 0010  
 Convert each Number D 2  
 Solution is D2

Ex-4 Convert ED2 to decimal.  
 We know in hexadecimal system radix is 16. In decimal system E is 14 and D is 13. Therefore  

$$ED2 = d_2 \times r^2 + d_1 \times r^1 + d_0 \times r^0$$

$$= 14 \times 16^2 + 13 \times 16^1 + 2 \times 16^0$$

$$= 3584 + 208 + 2 = 3794_{10}$$



20

2024

Saturday

JANUARY

2024

JANUARY

MTWTFSSMTWTFSS  
 1 2 3 4 5 6 7 8 9 10 11 12 13 14  
 15 16 17 18 19 20 21 22 23 24 25 26 27 28  
 29 30 31

Ex-5 Convert  $(ABCD)_{16}$  to decimal.

$$\begin{aligned} (ABCD)_{16} &= A \times r^3 + B \times r^2 + C \times r^1 + D \times r^0 \\ &= 10 \times 16^3 + 11 \times 16^2 + 12 \times 16^1 + 13 \times 16^0 \\ &= 40960 + 2816 + 192 + 13 \\ &= 43981_{10} \end{aligned}$$

Ex-6 Convert  $72905_{10}$  to hexadecimal.

Successive division      Remainder      Hex notation

$$16 \overline{) 72905}$$

$$16 \overline{) 4556} \quad 1101 \dots \dots \dots 01019$$

$$16 \overline{) 284} \quad 01004 \dots \dots \dots 010112$$

$$16 \overline{) 17} \quad \dots \dots \dots 12$$

$$16 \overline{) 1} \quad \dots \dots \dots 1$$

Reading the remainders up from the bottom,

The result is  $11,CC9_{16}$ .

21 Sunday