

NSSA-102 Computer system Concepts (Fall 2023)

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Homework 1

Student Name:

A. If $N = 615.301$ in octal, what is N in hexadecimal?

[1 pt]

Show your work in below.

$$\begin{aligned}
 & (615.301)_8 \rightarrow ()_2 \\
 & \begin{array}{c}
 \text{110} \leftarrow 6 \\
 \text{001} \leftarrow 1 \\
 \text{101} \leftarrow 5 \\
 \text{000} \leftarrow 3 \\
 \text{011} \leftarrow 0 \\
 \text{001} \leftarrow 1
 \end{array} \rightarrow (110\ 001\ 101.\ 011\ 000\ 001)_2 \\
 & \underline{001\ 110\ 001\ 101.\ 011\ 000\ 001}_2 \rightarrow ()_{16} \\
 & \quad \quad \quad 1 \quad \quad 8 \quad \quad D \quad \cdot \quad 6 \quad \quad 0 \quad \quad 8 \\
 & \Rightarrow (18D.608)_{16}
 \end{aligned}$$

B. If $N = 365.125$ in decimal, what is the value of N in base r

$= 4$? [1 pt]

Show your work in below.

$$\begin{aligned}
 & (365.125)_{10} \rightarrow ()_4 \\
 & 365/4 = 91 ; r = 1 \quad 0.125 \times 4 \\
 & 91/4 = 22 ; r = 3 \quad = 0.500 ; I = 0 \\
 & 22/4 = 5 ; r = 2 \quad 0.5 \times 4 \\
 & 5/4 = 1 ; r = 1 \quad = 2.0 ; I = 2 \\
 & 1/4 = 0 ; r = 1 \\
 & \Rightarrow (11231.02)_4
 \end{aligned}$$

- C. If $N = 100000$ in binary, and $N = 112$ in base r , then what is the value of r ? _____ Show your work in below. [1 pt]

$$(100000)_2 \rightarrow (112)_r$$

$$(100000)_2 \Rightarrow ()_{10}$$

$$0 \times 2^0 + 0 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + 1 \times 2^5$$

$$= (32)_{10}$$

$$(112)_r = (32)_{10}$$

$$r^0 \times 2 + r^1 \times 1 + r^2 \times 1 = 32$$

$$2 + r + r^2 = 32$$

$$r^2 + r = 30$$

$$r^2 + r - 30 = 0$$

$$r^2 + 6r - 5r - 30 = 0$$

$$r(r+6) - 5(r+6) = 0$$

$$(r-5)(r+6)$$

$$\therefore r = 5$$

$$r = -6 \text{ X}$$

$$\therefore r = \underline{\underline{5}}$$

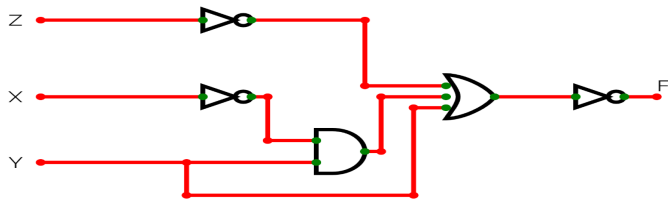
- D. If $N = 547$ in decimal, what is N in BCD? _____ [0.5 pt]

$$(547)_{10} \rightarrow ()_{BCD}$$

$$\begin{array}{ccc} \downarrow & \downarrow & \downarrow \\ 0101 & 0100 & 0111 \end{array} \Rightarrow (010101000111)_{BCD}$$

- E. What is the minimal number of bits needed to assign binary codes to 48 colors? 6 [0.5 pt]

- F. Fill-in the below truth table for the following circuit. [1 pt]



XYZF

0 0 0

0 0 1

0 1 0

0 1 1

1 0 0

1 0 1

1 1 0

1 1 1

G. Fill-in the below truth table for the following equation. [1 pt]

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ABFG

0 0

0 1

1 0

1 1

H. Using Boolean algebra, prove that [1 pt]