Midterm 2 Version 1 Solution

April 3, 2020

Question 1

1.

$$\begin{aligned} 100 \div 2 = 50, &\textbf{ Remainders } 0 \\ 50 \div 2 = 25, &\textbf{ Remainders } 0 \\ 25 \div 2 = 12, &\textbf{ Remainders } 1 \\ 12 \div 2 = 6, &\textbf{ Remainders } 0 \\ 6 \div 2 = 3, &\textbf{ Remainders } 0 \\ 3 \div 2 = 1, &\textbf{ Remainders } 1 \\ 1 \div 2 = 0, &\textbf{ Remainders } 1 \end{aligned}$$

Then, it follows from above that the binary representation of 100 is $(1100100)_2$.

2. The smallest number that can be expressed by an n-digit balanced ternary representation is

$$\sum_{i=0}^{n-1} d_i \cdot 3^i, \text{ where } d_i \in \{0, 1, 2\} \tag{1}$$

Correct Solution:

The smallest number that can be expressed by an n-digit balanced ternary representation is

$$-\left[\sum_{i=0}^{n-1} 3^i\right] \tag{2}$$

Notes:

- Realized professor is asking for an example of the smallest number.
- Learned a negative number could be expressed in in ternary or binary representation of numbers.

3.

$f(n) \in \Omega(n)$ - True	$g(n) \in \Omega(n)$ - False	$f(n) \in \mathcal{O}(g(n))$ - False
$f(n) \in \Theta(g(n))$ - False	$g(n) \in \Theta(\log_3 n)$ - True	$f(n) + g(n) \in \Theta(f(n))$ - True

Question 2

Question 3

Question 4