EE1001
Foundations of Digital Techniques

Sequences and Series

Tutorial 3 (week 10)

Sequences and series

Recurrence relations of sequences

Question 1

- Determine the following statements whether they are true of false

$$\sum_{n=k}^{N} a_n \times \sum_{n=k}^{N} b_n = \sum_{n=k}^{N} (a_n \times b_n)$$

$$c \times \prod_{n=k}^{N} a_n = \prod_{n=k}^{N} c a_n$$

$$\prod_{n=k}^{N} a_n + \prod_{n=k}^{N} b_n = \prod_{n=k}^{N} (a_n + b_n)$$

Question 2

- Find the general formula of the following sequences
  1) {0, 3, 2, 5, 4, …}
  2) {-1, 5, -7, 17, -31, …}

Question 3

- Find the first 3 terms and the 11^{th} term of the sequence whose general term is given by $a_n = 4(-2)^n$

Question 4

- Use summation notation and product notation to denote the following formulas
  1) $0 + 3 + 2 + 5 + 4 + \ldots$
  2) $-1 \times 5 \times -7 \times 17 \times -31 \times \ldots \times 1025$

Question 5

- Given the initial condition $a_1 = 3$, express $a_n = 1 + 2a_{n-1}$ using an explicit formula.

Question 6

- The device population increases 20% from time n-1 to time n. Given the initial condition of a_1 = 1000, estimate the number of devices at the time instant 38.

Question 7

- Find the first four terms and state whether the sequence is arithmetic, geometric, or neither.
  1) $a_n = 3n + 2$
  2) $a_n = n^2 + 1$
  3) $a_n = 3*2^n$

Question 8

- Find the sum of the following series

$$\sum_{k=2}^{24}(8-2k)$$

Question 9

- Find the value of n for the series in which

  $a_1 = 5$

  $d = 3$

  $S_n = 440$

Question 10

- The sum of the first 3 terms of an arithmetic series is 21 and the sum of the next three terms is 66. Find the value of the first term and the common difference.

Question 11

- Find the sum, if possible:

1) $2\sqrt{2} + 8 + 16\sqrt{2} + ...$

2) 1/96 + -1/192 + 1/384 + …

Question 12

Find a_9 of $\sqrt{2}, 2, 2\sqrt{2},...$