cse547/ams547 ONE QUESTION Quiz 1 Spring 2017
(25 points)

NAME **ID:** **ams/cs**

Given Recursive Formula **RF**:

$$\begin{aligned} f(i) &= \alpha_i, && i = 1, \cdots, d-1 \\ f(dn+j) &= cf(n) + \beta_j, && n \geq 1, 0 \leq j < d \end{aligned}$$

We proved the following closed formula **CF**:

$$f((b_m, b_{m-1}, \cdots, b_1, b_0)_d) = (\alpha_{b_m}, \beta_{b_{m-1}}, \cdots, \beta_{b_1}, \beta_{b_0})_c$$

where β_{b_j} are defined by

$$\beta_{b_j} = \begin{cases} \beta_0 & b_j = 0 \\ \beta_1 & b_j = 1 \end{cases}; \quad j = 0, ..., m-1,$$

QUESTION Part 1: 5pts

Given Recursive Formula RF:

$f(1) = 34,\ \ f(2) = 5,$

$f(3n) = 10f(n) + 76,\ \ f(3n+1) = 10f(n) - 2,\ \ f(3n+2) = 10f(n) + 8$

Evaluate $f(19)$. Write proper formula- do not need to evaluate numbers!

Part 2: 20pts

Use the **repertoire method** to **solve** the general four-parameter recurrence **RF:**

$f(1) = \alpha,$

$f(2n) = 3f(n) + \gamma n + \beta_0, \quad f(2n+1) = 3f(n) + \gamma n + \beta_1$

Solve means to FIND a system of equations needed to evaluate the closed formula **CF:**

$$f(n) = \alpha A(n) + \gamma B(n) + \beta_0 C(n) + \beta_1 D(n).$$

To do so follow the steps below

Step 1. Use the proper form of the closed formula solution from **Part 1**

Step 2. $A(n) = 3^k,\ n = 2^k + \ell,\ 0 \leq \ell < 2^k,\ n \in N - \{0\}$

Step 3. Use **repertoire function** $f(n) = 1,$ for all $n \in N - \{0\}$

Step 4. Use **repertoire function** $f(n) = n,$ for all $n \in N - \{0\}$

Step 5. write your system of equations. Do not solve it.

Write carefully your solution on pages provides. Indicate which STEP are you solving.

Solution

Step 1:

Solution Space

Solution Space