3) (10 pts) ANL (Summations)

With proof, find the ordered pair of values (a, b) which satisfy the equation below?

$$\sum_{k=1}^{2n}(ak+b) = 7n^2 + 3n$$

Simplify the left hand side in terms of a and b to get to this point:

$$\sum_{k=1}^{2n}(ak+b) = 7n^2 + 3n$$

$$\frac{a(2n)(2n+1)}{2} + b(2n) = 7n^2 + 3n$$

$$an(2n+1) + 2bn = 7n^2 + 3n$$

$$2an^2 + (2b+a)n = 7n^2 + 3n$$

In order for this equation to always be true, we have to equate coefficients, giving us the two following simultaneous equations:

$$2a = 7 \qquad\qquad 2b + a = 3$$

Solving the first equation, we find that $a = \frac{7}{2}$. Plugging this into the second equation, we have

$$2b + \frac{7}{2} = 3$$

$$2b = -\frac{1}{2}$$

$$b = -\frac{1}{4}$$

Thus, the desired ordered pair (a, b) is $(\frac{7}{2}, -\frac{1}{4})$.

Grading: 2 pts sum of ak, 1 pt sum of b, 2 pts simplifying expression, 2 pts equating coefficients, 1 pt solving for a, 2 pts solving for b.

Computer Science Foundation Exam

January 15, 2022

Section D

ALGORITHMS

SOLUTION

Question #	Max Pts	Category	Score
1	5	DSN	
2	10	ANL	
3	10	ALG	
TOTAL	25		

You must do all 3 problems in this section of the exam.

Problems will be graded based on the completeness of the solution steps and <u>not</u> graded based on the answer alone. Credit cannot be given unless all work is shown and is readable. Be complete, yet concise, and above all <u>be neat</u>. For each coding question, assume that all of the necessary includes (stdlib, stdio, math, string) for that particular question have been made.