CGG SG Software Developer: Technical Test

Please submit documented working codes for the following four questions.

- Only functions accepting appropriate arguments are required.

- Please write the code in C/C++/Fortran. Put all functions in one file, named "assignment.c", "assignment.cpp" or "assignment.f" (based on the chosen language)

- **Important**: Please aim for code robustness and good computational complexity.

I. SEARCH

Given an integer array a of length n and an integer x, return the index of x within a.

II. ROOT-MEAN-SQUARE (RMS) NORMALIZATION

Given a float array a of length n, return an RMS-normalized array $\tilde{a}$. i.e.

$$\tilde{a}_i = c \times a_i,$$
$$\sqrt{\frac{\sum_i \tilde{a}_i^2}{n}} = 1, \tag{1}$$

where c is a constant to be determined.

III. CONVOLUTION OF ARRAYS

Given two float arrays a and b, both of length n, write a function that computes the convolution, i.e.

$$c_i = \sum_j a_j b_{i-j} \tag{2}$$

IV. SMOOTHING

Given a float array a of length n, perform mean-smoothing over a window of size $2w + 1$, i.e. compute

$$b_i = \frac{1}{2w + 1} \sum_{j=i-w}^{j=i+w} a_j \tag{3}$$