

CSE 340 Midterm 2

Olcay Taner YILDIZ

I. QUESTION (16 POINTS)

Write a parallel function which finds the square root of an integer M just by trying all numbers from 1 to $M - 1$. For example, if you are trying to find the square root of 64, you try all numbers from 1 to 63 and check if $1^2, 2^2, \dots, 63^2$ is equal to 64.

II. QUESTION (16 POINTS)

Write a parallel function which finds the number of integer solutions to the equation

$$x^2 + y^2 = z^2 \quad (1)$$

where $1 < x, y, z < 1000$.

III. QUESTION (16 POINTS)

Write a parallel function where the first processor reads a sequence of integers and broadcasts all those numbers to all processors. The first processor will first read the number of integers.

IV. QUESTION (16 POINTS)

Write a parallel function which checks if there are two numbers in array a whose sum is K . You can suppose that all processors have n/p elements of the array a . You are not allowed to send elements of a between processors.

V. QUESTION (18 POINTS)

Write a parallel function where the processors play hot potato game. The processor 0 generates a random number i between 1 and $p - 1$ and broadcasts i to all processors. Processor i then generates a random number j between 1 and $p - 1$ and sends j to processor 0. Then processor 0 broadcasts j to all processors. Processor j then generates a random number k between 1 and $p - 1$ and sends k to processor 0. The play continues until a processor with index i generates a random number i , in which case that processor loses the game. The first processor informs all other processors by sending message $-i$, which shows processor i lost the game.

VI. QUESTION (18 POINTS)

Write a parallel function which finds the variance of elements in the array a . You can suppose that all processors have n/p elements of the array a . Variance of n elements is calculated as

$$S = \frac{\sum_{i=1}^n (a[i] - m)^2}{n - 1} \quad (2)$$

where m is the average of those n numbers defined as

$$m = \frac{\sum_{i=1}^n a[i]}{n} \quad (3)$$

You are not allowed to send elements of a between processors.