SEGMENTED AND INCREMENTAL SIEVE

1. What is the main advantage of the segmented sieve algorithm over the traditional sieve of Eratosthenes algorithm?

- a)It uses less memory.
- b)It is faster for small ranges of numbers.
- c)It is easier to implement.
- **d)It can handle larger ranges of numbers.**

Ans: d) It can handle larger ranges of numbers.

The segmented sieve algorithm is designed to efficiently find prime numbers in a specified range, making it suitable for handling larger ranges of numbers without requiring excessive memory.

2.Which of the following is true about the incremental sieve?

- **It only finds prime numbers.**
- It finds both prime and composite numbers.
- It only finds composite numbers.
- It does not find any numbers.

Ans: **It only finds prime numbers.**

3.What is the output of the incremental sieve when n=20 is given as input?

- 2 3 5 7 11 13 17
- 2 3 5 7 11 13 17 19 20
- **2 3 5 7 11 13 17 19**
- 2 3 5 7 12 13 17 19

Ans: c) 2 3 5 7 11 13 17 19

The incremental sieve algorithm would identify the prime numbers up to 20, which are 2, 3, 5, 7, 11, 13, 17, and 19.

4."f():

```
ans = 0
for i = 1 to n:
    for j = i; j <= n; j += i:
        ans += 1        print(ans)"
```

- O(logn)
- O(n)
- O(nlogn)
- O(n*n)

Ans: **c) O(nlogn)**

5. What is the space complexity of the segmented sieve?

- O(n)
- O(n log n)
- O(n log log n)
- **O(sqrt(n))**

Ans: **O(sqrt(n))**

6. Which of the following is a disadvantage of the incremental sieve?

- It requires a large amount of memory.
- It is slower than the segmented sieve.
- **It only works for small ranges.**
- It can only find prime numbers.

Ans: It only works for small ranges.

7. Which of the following is a disadvantage of the segmented sieve?

- **It requires a large amount of memory.**
- It is slower than the incremental sieve.
- It only works for small ranges.
- It can only find prime numbers.

Ans: a) It requires a large amount of memory.

The segmented sieve can require a significant amount of memory, especially for larger ranges, as it needs to store the primes within the segments being processed. This can be a drawback in terms of memory usage.

8.What is the formula for calculating the nth prime number using the Incremental Sieve algorithm?

- n * (n - 1) + 2
- **n * n - n + 1**
- n * n + n + 1
- n * n + 2

Ans: b) n * n - n + 1

The formula for calculating the nth prime number using the Incremental Sieve algorithm is typically expressed as n * n - n + 1. This formula gives the position of the nth prime number in the sequence of natural numbers.

9.Which algorithm is best suited for finding all prime numbers in a small range?

- Segmented sieve
- **Incremental sieve**
- Both algorithms are equally suited for this task.
- Neither algorithm is suited for this task.

Ans: b) Incremental sieve

The incremental sieve is often more suited for finding all prime numbers in a small range. It works well when you need to generate primes sequentially and is efficient for smaller ranges. Segmenting the sieve may not provide significant benefits for small ranges, making the incremental sieve a suitable choice in such cases.

10. What is the advantage of using the Segmented Sieve algorithm over the trial division method for prime number generation?

- **The Segmented Sieve algorithm is faster**
- The Segmented Sieve algorithm is simpler to implement
- The Segmented Sieve algorithm can be parallelized
- d)The Segmented Sieve algorithm can generate prime numbers up to a larger limit

Ans: The Segmented Sieve algorithm can generate prime numbers up to a larger limit