

Question 1

For an array-based Vector of n elements - what is the time complexity for an insertion into rank n (the end) of the vector?

- A) $O(1)$
- B) $O(n)$
- C) $O(n^2)$
- D) $O(n \log n)$
- E) $O(n^3)$

Question 2

For a problem of size n , which of the following O-notation expressions correctly describes the algorithmic time complexity of the following code segment?

```
for ( int i=0; i < n; i++ )
{
    for ( int j=100; j > 0; j-- )
    {
        for ( int k=0; k < n; k++ )
        {
            // These statements run in constant time.
            ...
        }
    }
}
```

- A) $O(n)$
- B) $O(1000n)$
- C) $O(n^2)$
- D) $O(100n^2)$
- E) $O(2^n)$

Question 3

Which of the following is the correct definition for Big-Omega?

- A) $f(n)$ is $\Omega(g(n))$ if there are constants, c' and c'' , both greater than zero, and an integer constant $n_0 \geq 1$, such that $c'.g(n) \leq f(n) \leq c''.g(n)$ for $n \geq n_0$
- B) $f(n)$ is $\Omega(g(n))$ if there is a constant, c , greater than zero, and an integer constant $n_0 \geq 1$, such that $f(n) \leq c.g(n)$ for $n \geq n_0$
- C) $f(n)$ is $\Omega(g(n))$ if there are constants, c' and c'' , such that $c'.g(n) \leq f(n) \leq c''.g(n)$ for all n .
- D) $f(n)$ is $\Omega(g(n))$ if there is a constant, c , greater than zero, and an integer constant $n_0 \geq 1$, such that $c.g(n) \leq f(n)$ for $n \geq n_0$
- E) None of the above.

Question 4

A Stack is being used to store job identifiers.

```
stack.push(1);
stack.push(5);
stack.pop();
stack.push(8);
stack.top();
stack.push(10);
stack.push(3);
stack.pop();
stack.pop();
```

At this point what would be the value at the top of that stack?

- A) 1
- B) 3
- C) 5
- D) 8
- E) 10

Question 5

Consider the following recursive method. What type of recursion best describes the recursion style used?

Algorithm Sum(A, i, n):

Input: An array A and integers i and n

Output: The sum of n integers in A starting at index i

```
if  $n = 1$  then
    return  $A[i]$ 
return  $A[i] + \text{Sum}(A, i+1, n-1)$ 
```

- A) Multiple recursion
- B) Linear recursion
- C) Base case recursion
- D) Binary recursion
- E) None of the above