

### Q1

- a. E
- b. A
- c. D
- d. C
- e. A
- f. B
- g. C
- h. E
- i. B
- j. C
- k. D
- l. B
- m. C
- n. D
- o. D

### Q2

#### (A)

(i) 3 steps for Binary Search.

(ii) Linear Search is used when the list is not sorted. Binary Search is used when the list is sorted. Interpolation Search is used when the list is sorted with systematically distributed elements.

#### (B)

```
>>> for n in [1, 2, 3]:  
    square = n**2  
    print(n, "squared = ", square)
```

```
1 squared = 1  
2 squared = 4  
3 squared = 9
```

(C)

(i)

```
1 def sum(n):  
2     s = 0  
3     for i in range(1, n + 1):  
4         s += i*i  
5     return s  
6  
7  
8 print(sum(4))
```

(ii)

```
10 def sum(n):  
11     if n == 1:  
12         return 1  
13     #Base Case  
14     else:  
15         return pow(n, n) + sum(n - 1)  
16     #Recursive Step  
17
```

Q3

(A)

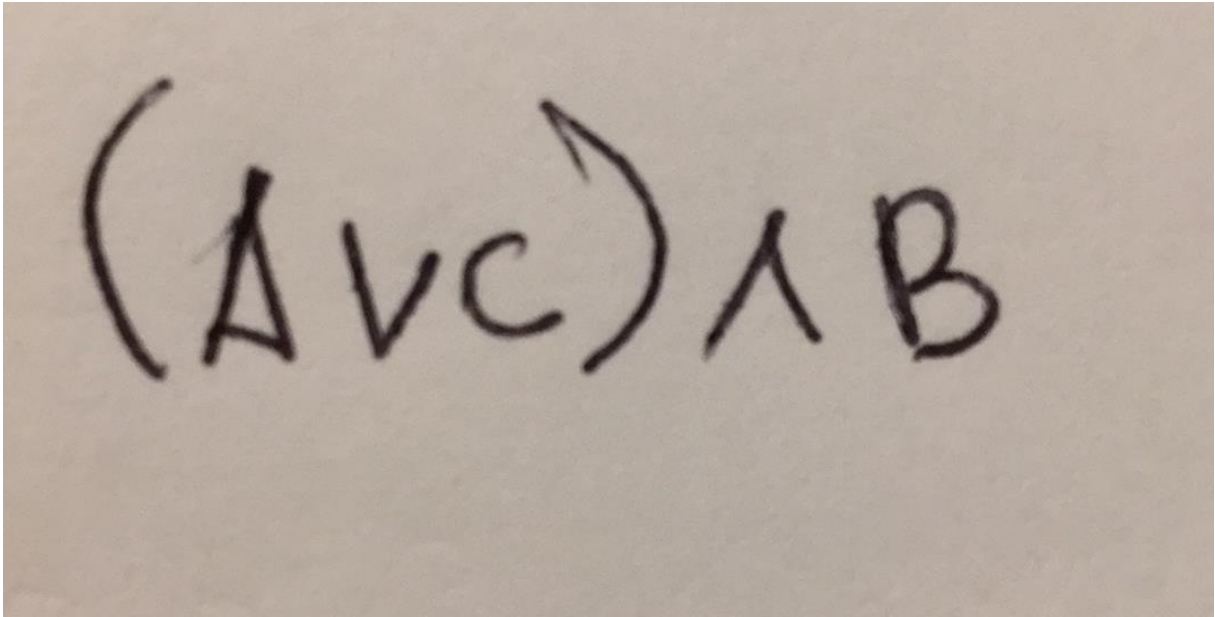
(B)

(i)

$$(A \wedge B) \vee ((B \vee C) \wedge (B \wedge C))$$

(ii)

(iii)



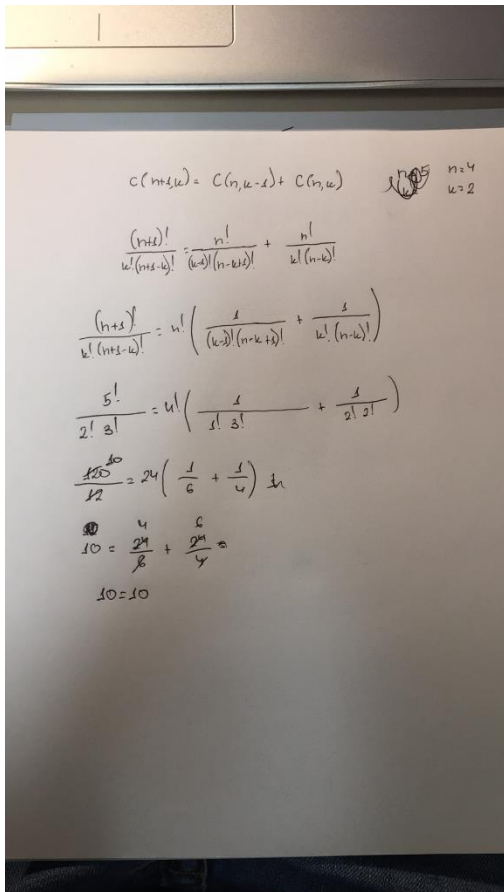
A handwritten logical expression in black ink on a light-colored background. The expression is  $(A \vee C) \wedge B$ .

(Q4)

(a)

(i)  $(1/4) * 8 = 2$  The expected number of questions Jack answers correctly is 2.

(b)



Handwritten mathematical derivation for Stirling numbers of the second kind,  $S(n, k)$ , using the recurrence relation  $S(n+1, k) = S(n, k-1) + k S(n, k)$ . The derivation is for  $n=4$  and  $k=2$ .

$$S(n+1, k) = S(n, k-1) + k S(n, k)$$
$$\frac{(n+1)!}{k!(n+1-k)!} = \frac{n!}{(k-1)!(n-k+1)!} + \frac{n!}{k!(n-k)!}$$
$$\frac{(n+1)!}{k!(n+1-k)!} = n! \left( \frac{1}{(k-1)!(n-k+1)!} + \frac{1}{k!(n-k)!} \right)$$
$$\frac{5!}{2!3!} = 4! \left( \frac{1}{1!2!} + \frac{1}{2!2!} \right)$$
$$\frac{120}{12} = 24 \left( \frac{1}{2} + \frac{1}{4} \right)$$
$$10 = \frac{24}{2} + \frac{24}{4}$$
$$10 = 10$$

