

Assignment 1

Kuntal Sudhir Kokate - EE18BTECH11028

Download all latex-tikz codes from

<https://github.com/Kkuntal990/C-DS/blob/main/Assignment1/assignment1.tex>

1 PROBLEM

(Q 48) Consider the following C function.

```
int tob(int b, int *arr){
    int i;
    for (int i = 0; b > 0; i++){
        if(b%2)
            arr[i] = 1;
        else
            arr[i] = 0;
        b = b / 2;
    }

    return (i);
}
```

```
int pp(int a, int b){
    int arr[20];
    int i, tot = 1, ex, len;
    ex = a;

    len = tob(b, arr);
    for (int i = 0; i < len; i++)
    {
        if(arr[i] == 1)
            tot = tot * ex;
        ex = ex * ex;
    }

    return tot;
}
```

The value returned by $pp(3,4)$ is ?

2 SOLUTION

$$pp(3,4) = 81$$

Explanation

Characteristics of tob function:

- 1) If $b \geq 2^{(length(arr))}$, tob returns an error due to buffer overflow.
- 2) Converts positive integers to their binary representation.
- 3) In the case of negative integer, it returns 1 as output.

$$tob(x, \mathbf{V}) = \begin{cases} 1 & x < 0 \\ (x)_2 & 0 \leq x < 2^{|\mathbf{V}|} \end{cases}$$

where $x \in \mathbb{Z}$ and $\mathbf{V} = \{v_1, v_2, \dots, v_{|\mathbf{V}|}\}$ where $v_i \in \mathbb{Z}$.

For eg. $tob(4, arr) = 100$.

We have $a = 3$ and $b = 4$ and we have $len(arr) = 20$

$$\implies b < 2^{20}$$

Final answer is updated in function pp only when the corresponding bit is set in binary representation of b as evident from the below for loop.

```
for (int i = 0; i < len; i++)
{
    if(arr[i] == 1)
        tot = tot * ex;
    ex = ex * ex;
}
```