Assignment 1

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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.

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

where $x \epsilon \mathbb{Z}$ and $\mathbf{V} = v_1, v_2, ..., v_{|\mathbb{V}|}$ where $v_i \epsilon \mathbb{Z}$.
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;
}
```