HW-1

EE:2801 DSP-Lab

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I. Question

Simulate fix-point arithemetic in C (addition and multiplication)

II. solution

C simulation,

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

int fixpoint(double a, int Q)
{
    int y = round(a * pow(2, Q));
    return y;
}

int main()
{
    int Q = 12;
    double x1 = 3.1425;
    double x2 = 4.2357;
    double sum_final, product_final;
    double sum_values[10], product_values[10];

    for (int i = 3; i <= Q; i++)
    {
        int sum = fixpoint(x1, i) + fixpoint(x2, i);

        sum_values[i - 3] = sum_final = sum / (pow(2, Q));

        double product = fixpoint(x1, i) * fixpoint(x2, i);

        product_values[i - 3] = product_final = product / (pow(pow(2, Q), 2));
    }
    printf("value of sum at different fractional bits -->");
    for (int i = 0; i <= Q - 3; i++)
    {
        printf("%.4f ", sum_values[i]);
```

```
    }

    printf("\n");

    printf("value of product at different fractional bits -->");
    for (int i = 0; i <= Q - 3; i++)
    {
        printf("%.4f ", product_values[i]);
    }

    printf("\n");

    printf("sum of the fixpoint number is %.4f\nproduct of the fixpoint number is %.4f", sum_final,
        product_final);
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS                                                    Code
[Running] cd "/home/jay/Desktop/Dsp-lab/C/" && gcc fixp.c -o fixp -lm && "/home/jay/Desktop/Dsp-lab/C/"fixp
value of sum at different fractional bits -->0.0144 0.0288 0.0579 0.1152 0.2305 0.4609 0.9224 1.8445 3.6892 7.3782
value of product at different fractional bits -->0.0001 0.0002 0.0008 0.0032 0.0130 0.0519 0.2080 0.8319 3.3279 13.3107
sum of the fixpoint number is 7.3782
product of the fixpoint number is 13.3107
[Done] exited with code=0 in 0.053 seconds
```