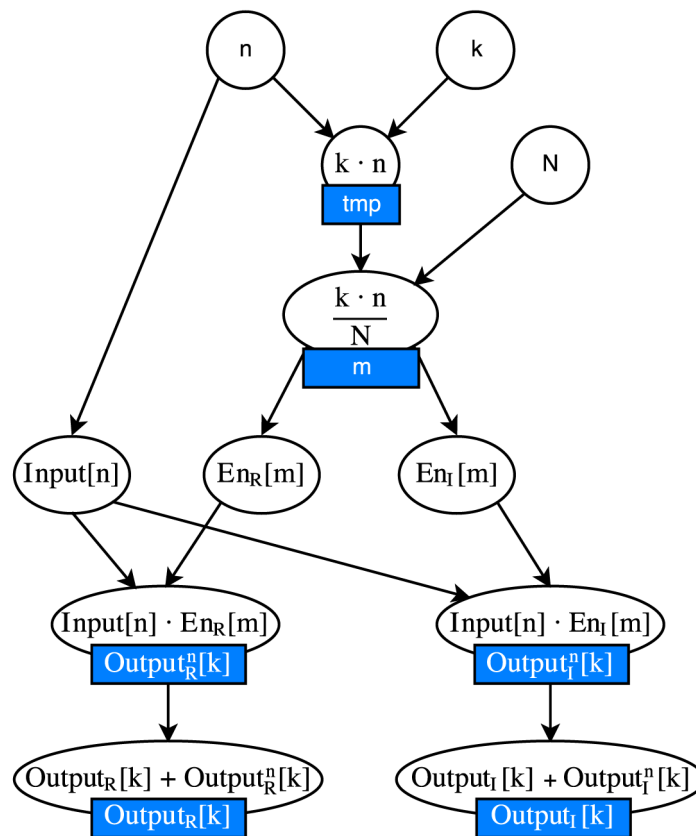


dsPIC33: Exercise

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1 Question 1



2 Question 2

2.1 Computation of the value m

```
INT16U unsigned16temp;  
unsigned16temp = (k * n);
```

```
m = (INT8U) (unsigned16temp / (INT16U) N);
```

If we directly do the computation $m = k * n / N$ we would get a wrong result. In fact the multiplication would be too big some the result would overflow and be wrong. To solve that problem, we use a intermediate var of 16bit to store the result of the multiplication and then do the division and then cast it back to 8 bits, the cast should be correct because the result of the division should stands on 8bits if the inputs are correct.

2.2 Computation of the real part

```
signed16temp_r = (INT16S)input[n] * (INT16S) en_r[m];
```

First we cast the 8 bits fixed point integer to two 16bits fixed point integer and then do the multiplication as shown in the *example2.c*. We put the result in a 16bits integer so the result would be correct

```
signed8temp = (signed16temp_r+128) >> 8;
```

Then we are required to put the result in a 8 bits register so to get better result we first round it and then do the shift to get the most significant bits

```
signed16temp_r = (INT16S) signed8temp + (INT16S) output_r[k];
```

2.3 Computation of the imaginary part

Actually it is the same as the real part with othe variable name

3 Question 3

3.1 Computation of the value m

```
unsigned16temp = (k * n);
```

Since we do $\text{INT16} = \text{INT8} * \text{INT8}$ no overflow will occur ($28 * 28 = 216$). There is no information lost so the accuracy is maximum.

```
m = (INT8U) (unsigned16temp / (INT16U) N);
```

If the input are in there correct range, no overflow will occur because m must be between 0 and 127 included, so it is ok to cast it to a 8 bit integer. Some precision can be lost during the division since the result is a integer all the time. Plus it loose the decimal, so for example 1.9 will be 1 if interpreted as an integer instead of 2 for the nearest integer.

3.2 Computation of the real part

3.3 Computation of the imaginary part

```
INT16S= INT8S * INT8S
```

4 Question 4

The more the frequency grows, the nearest the sample are. So that mean that two sample will have almost the same value. From a certain point, we might see that the sample will have the same value.