Seungtack Baek

CE6305-501

Homework6

1. With 4 bit by 4bit multiply and add unit, we can
2. Time iterative multiply for 25×23

|  |  |  |  |
| --- | --- | --- | --- |
| C | u | v |  |
| --- | ------ | ------ |  |
| 0 | 000000 | 010111 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 011001 | 010111 | Shift: |
| 0 | 001100 | 101011 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 100101 | 101011 | shift: |
| 0 | 010010 | 110101 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 101011 | 110101 | shift: |
| 0 | 010101 | 111010 | m'pr lsb =0 so just shift: |
| 0 | 001010 | 111101 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 100011 | 111101 | shift: |
| 0 | 010001 | 111110 | m'pr lsb =0 so just shift: |
|  |  |  |  |
| 0 | 001000 | 111111 | = 575 |

3. Time iterative multiply for -23×25

|  |  |  |  |
| --- | --- | --- | --- |
| C | u | v |  |
| --- | ------ | ------ |  |
| 0 | 000000 | 011001 | m'pr lsb =1 so add: |
| + | 101001 |  |  |
| -- | ------ | ------ |  |
| 1 | 101001 | 011001 | Shift: |
|  | 110100 | 101100 | m'pr lsb =0 so just shift: |
|  | 111010 | 010110 | m'pr lsb =0 so just shift: |
|  | 111101 | 001011 | m'pr lsb =1 so add: |
| + | 101001 |  |  |
| -- | ------ | ------ |  |
| 1 | 100110 | 001011 | shift: |
|  | 110011 | 000101 | m'pr lsb =1 so add: |
| + | 101001 |  |  |
| -- | ------ | ------ |  |
| 1 | 011100 | 000101 | shift: |
|  | 101110 | 000010 | m'pr lsb =0 so just shift: |
|  |  |  |  |
| 1 | 110111 | 000001 | = -575 |

4. 25×-23 (by subtracting multiplicand)

|  |  |  |  |
| --- | --- | --- | --- |
| C | u | v |  |
| --- | ------ | ------ |  |
| 0 | 000000 | 101001 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 011001 | 101001 | Shift: |
| 0 | 001100 | 110100 | m'pr lsb =0 so just shift: |
| 0 | 000110 | 011010 | m'pr lsb =0 so just shift: |
| 0 | 000011 | 001101 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 011100 | 001101 | shift: |
| 0 | 001110 | 000110 | m'pr lsb =0 so just shift: |
| 0 | 000111 | 000011 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 100000 | 000011 | shift: |
| 0 | 010000 | 000001 | = 1041. Subtract m’cand from U |
| - | 011001 |  |  |
| -- | ------ | ------ |  |
| 1 | 110111 | 000001 | = -575 |
|  |  |  |  |

5. 25×-23 (subtract the multiplicand in the last iteration when the multiplier is negative.)

|  |  |  |  |
| --- | --- | --- | --- |
| C | u | v |  |
| --- | ------ | ------ |  |
| 0 | 000000 | 101001 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 011001 | 101001 | Shift: |
| 0 | 001100 | 110100 | m'pr lsb =0 so just shift: |
| 0 | 000110 | 011010 | m'pr lsb =0 so just shift: |
| 0 | 000011 | 001101 | m'pr lsb =1 so add: |
| + | 011001 |  |  |
| -- | ------ | ------ |  |
| 0 | 011100 | 001101 | shift: |
| 0 | 001110 | 000110 | m'pr lsb =0 so just shift: |
| 0 | 000111 | 000011 | m'pr lsb =1 so subtract: |
| - | 011001 |  |  |
| -- | ------ | ------ |  |
| 1 | 101110 | 000011 | shift: |
| 0 | 110111 | 000001 | = -575 |

6. -25×-23

|  |  |  |  |
| --- | --- | --- | --- |
| C | u | v |  |
| --- | ------ | ------ |  |
| 0 | 000000 | 101001 | m'pr lsb =1 so add: |
| + | 100111 |  |  |
| -- | ------ | ------ |  |
| 1 | 100111 | 101001 | Shift: |
| 1 | 110011 | 110100 | m'pr lsb =0 so just shift: |
| 1 | 111001 | 111010 | m'pr lsb =0 so just shift: |
| 1 | 111100 | 111101 | m'pr lsb =1 so add: |
| + | 100111 |  |  |
| -- | ------ | ------ |  |
| 1 | 100011 | 111101 | shift: |
| 1 | 110001 | 111110 | m'pr lsb =0 so just shift: |
| 1 | 111000 | 111111 | m'pr lsb =1 so subtract: |
| - | 100111 |  |  |
| -- | ------ | ------ |  |
| 0 | 010001 | 111111 | shift: |
|  | 001000 | 111111 | = 575 |