Superscalar Problem

1. Write an assembly program for computing \((M_1 \times M_2) + (M_3 \times M_4))/(M_5 + M_6)\) where \(M_1, \ldots\) denote the content of memory locations. Use a minimal number of registers.

2. Show the execution of your program on a superscalar processor using in-order-issue in-order-completion. Assume that there is an instruction window where all the fetched and decoded instructions can be stored. The remaining pipeline stages are RR, EX and WB. Assume that there are four fetch units, two decode units, two units for reading the registers, two ALUs and two units writing the registers.

3. Identify the dependencies in your code.

4. Remove the false dependencies by using register renaming.

5. Reorganize the code and draw a diagram showing the execution of the modified code on the above superscalar processor using out-of-order-issue out-of-order-completion.