1.

4 stage pipeline to execute n instructions take = k + n -1 clocks

4 + n – 1 clock, given 25% instructions that take 2 clock cycles

Time taken = (1 + 0.25\*#\_of\_cycles)\*4 + n – 1

= (1 + 0.25\*2)\*4 + n – 1

Speed up = without stalls/ with stalls

=

=

= = = ~0.66

Therefore, speed of execution with stalls is ~0.34 or less than speed of execution without stalls.

2.

Some of the pros and cons that I understand about the IFU is

Pros

- always fetches next 8/16 bytes no matter what the use is

- Automatically senses when MBR1 is ready

- Read next byte in MBR­­­1

- IFU has its own IMAR, to address memory when new word is needed

Cons

- Each cycle will check if the new word is ready then it will Write back in memory.

- Additional cycle is needed to check to readiness

3.

poptwo1 SP = SP -1

poptwo2 MAR = SP = SP -1; rd

poptwo3

poptwo4 TOS = MDR; goto Main 1