Lawrence Naidu
CPE 186
Collaborated with Sergio Zavala

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
$= \frac{4 + n - 1}{(1 + 0.25*2)*4 + n - 1}$
$= \frac{1}{1 + 0.5}$
$= \frac{1}{\frac{3}{2}} = \frac{2}{3}$ = ~0.66

Therefore, speed of execution with stalls is ~0.34 or $\frac{1}{3}$ 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 MBR_1 is ready
- Read next byte in MBR_1
- 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