Com S 321 **Activity 2**
Spring 2018

1. Suppose you have a load/store computer with the following instruction mix:

Operation	Frequency	No. of Clock cycles
ALU ops	40%	1
Loads	20%	3
Stores	15%	3
Branches	25%	4

(a) Compute the CPI for the above data. Show ALL your work.

(b) We observe that 30% of the ALU ops are paired with a load (i.e., they occur together), and we propose to replace these ALU ops and their loads with a new instruction. The new instruction takes 1 clock cycle. With the new instruction added, branches take 6 clock cycles. Compute the CPI for the new version. Show ALL your work.

(c) If the old clock is 20% faster than the new one, which version is faster and by what percent? Justify your answer quantitatively by showing ALL your work.

2. Suppose you have a load-store computer with the following instruction mix:

Operation	Frequency	Number of clock cycles
ALU ops	45 %	1
Loads	20 %	4
Stores	15 %	4
Branches	20 %	7

(a) Compute the CPI. Show all your work.

(b) We observe that 25% of the ALU ops are paired with a load (i.e., they occur together), and we propose to replace these ALU ops and their loads with a new instruction. Assume that this new instruction takes 3 clock cycles. However, with the new instruction added, branches will take 10 clock cycles instead of 7. Compute the CPI for the new version. Show all your work.

(c) If the clock rate for the new version is 25% faster than the old version, which version is faster and by what percent? Justify your answer quantitatively. Show all your work.