Computer Architecture
Assignment 12

Question 1:

Given : IPC = 0.8 -> CPI_{ideal} = 1/0.8 = 1.25

CPI = CPI_{ideal} + stall rate * stall penalty = CPI_{ideal} + f_{mem} * (AMAT - 1)

CPI = 1.25 + 0.3*(AMAT - 1)

AMAT = $L1_{hit\ time}$ + $L1_{miss\ rate}$ * ($L2_{hit\ time}$ + $L2_{miss\ rate}$ * $L2_{miss\ penalty}$)

AMAT = 1 + 0.05 * (10 + 0.5 * 100)

AMAT = 1 + 3 = 4

CPI = 1.25 + 0.3 * (4 - 1)

CPI = 1.25 + 0.9

CPI = 2.15

IPC = 1/CPI = 0.465

Question 2:

Motivation behind the development of prefetching is to boost the performance by reducing the compulsory and capacity misses. So that the processor could work at higher IPC than it was working before.

Intuition behind prefetching is that we try to guess which memory location is going to be fetched in the near future, So that we suffer lower penalty(or no penalty) and data can be accessed faster. There are two kinds of prefetching - 1) software prefetching 2) hardware prefetching.