COMPUTER ARCHITECTURE COE 308

QUIZ-1

PERFORMANCE OF COMPUTER SYSTEMS

The instruction distribution of a program P which is runs on a processor P is as follows: (1) 26% of instructions are Branch, (2) 17 % are Load, (3) 12% are Store, and (4) the rest are Register type. Each instruction of Branch, Load, Store, and Register takes 4 clocks, 3 clocks, 4 clocks, and 2 clocks, respectively. The processor was enhanced with respect to following two issues:

- The load instruction time was reduced to 2 clocks.
- The store instruction time was reduced to 3 clocks.

Evaluate the speedup of the enhanced processor for the running of program P.

Solution: Before the enhancement, the CPI = 0.26*4+0.17*3+0.12*4+0.45*2=2.93 clocks. After the enhancement, the CPI = 0.26*4+0.17*2+0.12*3+0.45*2=2.64 clocks. Thus the speedup is S=2.93/2.64=1.11.
Using Amdahl's law the enhanced fraction is the load and the store with a total of (1-0.17 - 0.12) = (1-0.29). Therefore the speedup is S = CPI / ((0.26*4+0.45*2) / CPI + (0.17*3) / (CPI*3/2) + (0.12*4) / (CPI*4/3))= 1.11. The processor became 11% faster.