CPTG445 HW 1

1. Assume a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and a frame size of 1280 x 1024.
   a) What is the minimum size in bytes of the frame buffer to store a frame?
   b) How long would it take, at a minimum, for the frame to be sent over a 100 Mbit/s network?

2. Consider two different implementations of the same instruction set architecture. The instructions can be divided into four classes according to their CPI (class A, B, C, and D). P1 with a clock rate of 2.5 GHz and CPIs of 1, 2, 3, and 3, and P2 with a clock rate of 3 GHz and CPIs of 2, 2, 2, and 2.
   a) Given a program with a dynamic instruction count of $1.0 \times 10^6$ instructions divided into classes as follows: 10% class A, 20% class B, 50% class C, and 20% class D, which is faster: P1 or P2?
   b) What is the global CPI for each implementation?
   c) Find the clock cycles required in both cases.

3. Consider a computer running a program that requires 250 s, with 70 s spent executing Floating Point (FP) instructions, 85 s executing Load/Store (L/S) instructions, 40 s spent executing branch (BR) instructions, and 55 s spent executing Integer (INT) instructions.
   a) By how much is the total time reduced if the time for FP instructions is reduced by 20%?
   b) By how much is the time for INT instructions reduced if the total time is reduced by 20%?
   c) Can the total time be reduced by 20% by reducing only the time for branch instructions?