CSCI 250

Performance Due: September 3, 2014 August 27, 2014

Work the following problems in the space provided. Show all work and circle your answers. You may check your work using a scientific calculator, but you must be able to do these calculations by hand. Show all of your work

1. (1.3)For a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and with a resolution of 1280 X 800 pixels, what should be the size (in bytes) of the frame buffer to store a frame?

2. (1.3) If a computer has a main memory of 2 GB, how many frames could it store assuming that the memory contains no other information.

3. (1.3) If a computer connected to a 1 gigabit Ethernet network needs to send a 256 Kbytes file, how long would it take?

Processor	Clock rate	No. Instructions	time
P1	2 Ghz	$20 \text{ X} 10^9$	$7 \mathrm{s}$
P2	$1.5~\mathrm{Ghz}$	$30 \text{ X} 10^9$	10 s
P3	$3~{ m Ghz}$	90 X 10 ⁹	$9 \mathrm{s}$

4. (1.4) The problems below, use the information in the following table.

(a) Find the IPC (instructions per cycle) for each processor.

(b) Find the clock rate for P2 that reduces its execution time to that of P1.

(c) Find the number of instruction for P2 that reduces its execution time to that of P3 $\,$

5. (1.4) Consider two different implementations of the same instruction set architecture. There are 4 classes of instructions, A, B, C and D. The clock rate and CPI are given in the following table:

	Clock Rate	CPI Class A	CPI Class B	CPI Class C	CPI Class D
P1	1.5 GHz	1	2	3	4
P2	2 GHz	2	2	2	2

(a) Given a program with 10⁶ instructions divided into classes as follows: 10% class A, 20% class B, 50% class C, and 20% class D, which implementation is faster?

(b) What is the Global CPI for each implementation?

(c) Find the clock cycles required in both cases.

6. (1.4)Compilers have a profound impact on the performance of an application on a given processor. This problem will explore the impact compilers have on execution time.

	Comp	oiler A	Compiler B		
	# instructions	execution time	# instructions	execution time	
a.	1.00E + 09	$1 \mathrm{s}$	1.20E + 09	1.4 s	
b.	1.00E + 09	0.8 s	1.20E + 09	$0.7 \mathrm{\ s}$	

(a) For the same program, two different compilers are used. The table above shows the execution time of the 2 different compiled programs. Find the average CPI for each program given that the processor has a clock cycle time of 1nS.

(b) Assume the average CPIs found in the question above, but that the compiled programs run on two different processors. If the execution times on the two processors are the same how much faster is the clock of the processor running compiler A's code versus the clock of the processor running compiler B's code?

(c) A new compiler is developed that uses only 600 million instructions and has an average CPI of 1.1. What is the speed up of this new compiler versus compiler A or B on the original processor in the problem above?