COMP 305 - Computer Organization, Fall 2018

Midterm-I Exam

Number :

Name-Surname :

Date : 1st November 2018

**Q1(20p).** Performance of a computer is calculated by the following formula;



How can reduce

a) Instructions per program

b) Clock cycles per Instruction

c) Seconds per Clock Cycle

a)

b)

c)

**Q2 (10p).** A person having an old, 32-bit computer came to you. In his computer, there is only register addressing mode and the memory is byte-addressable. He said that he wants to increase the size of memory in his computer from 4GB to 8GB. Please explain that why it is not possible.

**Q3 (20p)** Convert given instructions to binary format (MIPS reference data is at the last page).

a) add $s0, $s1, $s2

b) lw $t1, 16($s0)

c) ori $t1, $zero, (2018)hex

**Q4 (30p)** In a computer, there are three different type of instructions; Type-A, Type-B, Type-C. Type-A instructions take 1 cycle to execute while Type-B and Type-C take 4 and 10 cycles respectively.

For a given application, after compiling it produces 100.000 instructions. Among those machine instructions; 20% of them are in Type-A while 50% of them are in Type-B and the rest are in Type-C.

a) (10p) Calculate Instructions per Cycle (IPC) of the application in the given machine with the given compiler.

b) (20p) One of your friends suggested using another compiler and he claimed that this new compiler provides a better performance. As being a good computer scientist, you tested the compiler.

The new compiler generates 200.000 instructions and 50% of them are in Type-A while 40% are in Type-B and the rest is in Type-C. Which compiler presents a better performance, first or the second one? Also, calculate how much it is better than the other.

**Q5 (20p)** What is the compiled versions of the following code segment in MIPS? Assume that blt, bgt, ble, bge instructions are not implemented and you have slt (Set Less Than) instruction. Ex: slt $t1, $t2, $t3

while ( k < myArray[i])

k = k-i;

i=i\*2;

Note that i is in $s2, k is in $s3 and the base address of myArray is in $s4.