**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ID: \_\_\_\_\_\_\_\_\_\_\_\_**

**Department of Computer Science and Engineering**

**MIDTERM EXAMINATION**

**Fall2014**

**CSE340: Computer Architecture**

**Total Marks:**3**0Time Allowed: 1 hour**

Return the question with your answer script

**Section 1**

Question 1

1. Design a shift register using D-FF which can perform the below functionality: **5**
   * 1. Shift Left
     2. Shift Right
     3. Store Data
     4. Clear All

Ans: Only draw the figure of the shift register discussed in the class.



1. Design and explain the operation of a counter that can count from decimal 0 to 12 using T flip-flop. Also show the timing diagram **5**

**Ans:**Use four FF in the figure below and count the friquency.



Q3

Q’3



**Section 2**

Question 2

1. Define assembler and compiler. 2

Ans: Assembler: Assembler is a program that takes assembly instruction and converts into machine language/binary version.

Compiler: Compiler is a program that converts high level program into assembly instruction.

1. Explain various instruction types with necessary figures. 5

Ans: There are three different types of instructions available in MIPS. They are R, I and J type.







1. Why do you need a J type instruction? Give example. 3

Ans: We need J type instruction for unconditional branch, branching further away (more than 16-bit) and in procedure call.

J 1000 # jumping to PC+4+100

beq$s0, $s1, L1

becomes

bne$s0, $s1, L2

jL1

L2:

Jal 1000 # jump to pc+4+1000 and $ra stores PC+4

**3**

Question 3

1. Encodethe following MIPS instructions. For each instruction, you should identify the format type (R, I, or J format): 3
   1. **addi $14,$15,-73- I-Type**

**\*\*\*\*\*\*|01111|01110|**11111111**10110111**

* 1. **slt $7,$8,$9- R-Type**

**\*\*\*\*\*\*|01000|01000|00111|00000|\*\*\*\*\*\***

* 1. **J 1010 – J-Type**

**\*\*\*\*\*\*|**….**0000001111110010**

1. Write the equivalent MIPS code for the given C function: 4

*if (i!=j) f=g+h; else f=g-h;*

Ans:

beq $t0,$t1,Else

add $s0,$s1,$s2

Else: sub $s0,$s1,$s2

1. What is data overflow? When can we encounter overflow situation? 3

Ans: Data overflow is the is an event when a final result ends up being more than 32-bit long. Data overflow can occur in the following scenarios:

* + adding two positives yields a negative
  + or, adding two negatives gives a positive
  + or, subtract a negative from a positive gives a negative
  + or, subtract a positive from a negative gives a positive