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**Department of Computer Science and Engineering**

**FINAL EXAMINATION Fall 2014**

**CSE 340: Computer Architecture**

**Total Marks: 75 Time Allowed: 2.5 Hours**

* Return the question paper with your answer script

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

**Section 1( Answer any 4)**

###### Question No.1

1. Convert the below given C code into equivalent MIPS code: 6

if ( i <=j )

h = i + j;

else

h = i - j;

k = h + i;

1. Define Big Endian, little Endian addressing and Embedded system. 3
2. Compare various addressing modes available in MIPS. 6

Question No. 2

1. For each of the MIPS instruction: 3+9
   * Identify the instruction type
   * Specify as much machine code as possible and leaving unknown fields blank.
   * Draw the single cycle datapath for these instructions. Include only the parts of the datapath that are used in the instruction. Specify the bit width of any lines you draw.
     1. addi $8,$9,10
     2. lw $16,100($17)
     3. j 1010
2. In MIPS you have an instruction sra, what is this instruction? Why do you need this instruction? 3

## Question No. 3

1. Let’s assume you have an eight bit register (bit 7 for sign, bits 6~3 for exponent and remaining bits for fraction). Now show IEEE 754 binary representation of (-17.8)10. Also show the Hex equivalent. 5
2. With x=1 101 1100 and y=1 111 1110 representing 8-bit IEEE 754 floating-point numbers, perform, showing all the steps: 10

x+y

x\*y

Show decimal equivalents of the results.

## Question No. 4

1. Define CPU execution time, CPI and effective CPI. 3
2. Compare single cycle datapath, multicycle datapath and pipelining with necessary diagram(s). 5
3. Let’s assume you have an instruction lw $10, 40($11). Explain the steps involved in the instruction execution. 4
4. Why it is very important to design the clock cycle duration very carefully in datapath implementation? 3

## Question No. 5

1. Implementing multicycle datapath somewhat saves time in overall execution of a program. But implementation of multicycle datapath is not as straightforward. What are the challenges that you can face and what extra hardware you would need in the datapath and why? 5
2. Identify the hazards and also explain how you can overcome the hazards. Your answer should contain description and supporting diagram(s). 10
   * + - 1. sub $2, $1, $3

and $12, $2, $5

or $13, $6, $2

add $14, $2, $2

sw $15, 100($2)

* + - * 1. beq $2,$3, L

add $4,$5,$6

sub $7,$8,$9

L: or $4,$2,$8

**Section 2**

## Question No. 6

1. Simplify: 5
2. Design an ALU circuit and explain its operation. 5
3. What is PLA? Explain its purpose. 5

THE END