149

B.Sc. Engg. / HD CSE 3rd Semester (52) 19 February 2012 (Afternoon)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISAION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **WINTER SEMESTER, 2011 – 2012**

DURATION: 1 Hour 30 Minutes **FULL MARKS: 75**

CSE 4305: Computer Organization and Architecture

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) Explain *basic performance equation,* and then based on the notations used in the equation briefly explain the concept of CISC and RISC. 5+5

   b) i. Program execution time, $T = (N*S)/R$, is to be examined for a certain high-level language program. The program can be run on a RISC or a CISC computer. Both computers use pipelined instruction execution, but pipelining in the RISC machine is more effective than in the CISC machine. Specifically the effective value of S in the T expression for RISC machine is 1.2, but is only 1.5 for the CISC machine. Both machines have the same clock rate, R. 5+5

   What is the largest allowable value for N, the number of instructions executed in CISC machine, expressed as a percentage of the N value for the RISC machine, if time for execution on the CISC machine is to be no longer than that on the RISC machine?

   ii. Repeat the previous part if the clock rate R, for the CISC machine is 15 percent higher than that for the CISC machine.

   c) How SPEC rating is used to measure the performance of the computer? 5

2. a) i. With the help of an example, explain how we can achieve an effective S value of 1 through the use of instruction overlapping in *pipelining*? 8+4

   ii. Is it possible to reduce the effective S value to less than one? Justify your answer.

   b) Explain the reason for using binary number representation in 2's complement over 1's complement. 6

   c) Write a program to evaluate the expression $(A+B)*(C+D)$ in a single-accumulator processor. Assume that the processor has Load, Store, Multiply and Add instruction, and that all values fit in the accumulator. Do not forget to provide the corresponding *Register Transfer Notation* (RTN) for each instruction in the program. 7

3. a) Both of the following statements cause the value 400 to be stored in memory location 1004, but at different times. 6

```
ORIGIN      1004
DATAWORD    400
```

and

```
Move #400, 1004
```

Explain the difference.

b) Assume that the Word length in memory is 32 bits. Register R1 and R2 of a computer contain decimal values 1200 and 4600. What is the effective address of the memory operand in each of the following instructions? 10

i. Load 20(R1), R5
ii. Move #3000, R5
iii. Store R5, 30(R1, R2)
iv. Add -(R2), R5
v. Sub (R1)+, R5

c) Suppose that a stack runs from location 2000 (BOTTOM) down no further than location 1500. Write down the routines for a safe push and safe pop operation. 9

4. a) With the help of a diagram explain the following: 8

i. Subroutine linkage method.
ii. Call and Return instructions.

b) Write a program that reads a line of characters and displays it. Provide descriptions for each of the instructions in the program. 12

c) What is Relative addressing mode and where is it used most commonly? 5