RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General) Degree in Information and Communication Technology

Second Year Semester II Examination – April/May 2015

ICT 2408 – COMPUTER ORGANIZATION AND ARCHITECTURE

Answer any Five (5) questions. **TIME: Three (3) Hours**

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1. (a) What do you mean by computer organization? Give three examples for organizational attributes of a computer system. [5 Marks]

   (b) Explain an architectural design issue and an organizational issue using an example. [5 Marks]

   (c) What are the four main functions of a computer? [4 Marks]

   (d) What are BIOS and CMOS? Briefly explain their functions. [6 Marks]

2. (a) Draw a diagram to show the general structure of the IAS computer. [4 marks]

   (b) Describe the functions of each component of the diagram drawn above in part (a). [4 marks]

   (c) The memory of the IAS consists of 1000 storage locations, called words, of 40 binary digits (bits) each. Explain the terms "Number Word" and "Instruction Word" used in the IAS computer. [6 marks]

   (d) IAS computer made use of several registers. Describe briefly the use of the following registers.

      i. Memory Buffer Register.

      ii. Memory Address Register.

      iii. Instruction Buffer Register. [6 marks]

3. (a) Explain the basic instruction cycle. [4 marks]

   (b) List the steps of the fetch cycle. [5 marks]

   (c) Explain with the help of a diagram how to accommodate interrupts in an instruction cycle. [6 marks]

   (d) List and briefly define two approaches to dealing with multiple interrupts. [5 marks]

4. (a) What are the typical elements of a machine instruction? [4 marks]

(b) What do you mean by next instruction reference in a machine instruction? In most cases, there is no explicit reference to the next instruction in instruction formats. Explain why? [6 marks]

(c) A digital computer has a main memory with 24 bits per word. The instruction set consists of 150 different operations. All instructions have an operation code and an address field. Each instruction is stored in one word of memory.

i. How many bits are needed for the opcode?

ii. How many bits are left for the address field?

iii. What is the maximum allowable size for main memory? [10 marks]

5. (a) What is instruction pipelining? [4 marks]

(b) Assume that there is only a two-stage pipeline (fetch, execute). Draw a diagram to show how many time units are needed for a sequence of four instructions. [6 marks]

(c) What is the difference between instruction pipelining and superscalar architecture? [4 marks]

(d) What are the key features of superscalar architecture? [6 marks]

6. (a) What are the advantages of assembly language over machine language? [4 marks]

(b) Explain each line of the following assembly language program segment.

```
        SUB   CX,CX
        MOV   AX,[BX]
        CMP   AX,A
        JGE   TEST
        INC   CX
TEST:   CMP   CX,0
        JE    OUT
```

[7 marks]

(c) Describe the following input/output operations in assembly language:

i. Input a character from the keyboard with echo.

ii. Output a character on the monitor. [4 marks]

(d) Write an assembly language program segment to convert a lowercase letter to the corresponding uppercase letter. [5 marks]

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