



**RAJARATA UNIVERSITY OF SRI LANKA**  
**FACULTY OF APPLIED SCIENCES, MIHINTALE**

**B.Sc. Degree in Information and Communication Technology**

**Second Year Semester II Examination – April/May 2016**

**ICT 2408 – COMPUTER ORGANIZATION AND ARCHITECTURE**

**Answer ALL questions.**

**TIME: Three (3) Hours**

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- Q1.** (a) What do you mean by computer architecture? Give three examples for architectural attributes of a computer system. [5 Marks]
- (b) Explain why many computer manufacturers offer a family of computer models, all with the same architecture but with differences in organization. [5 Marks]
- (c) What is the importance of having a memory in a computer system based on the Von Neumann architecture? [4 Marks]
- (d) List and briefly define the main structural components of a computer. [6 Marks]
- Q2.** (a) List and briefly define the possible states that define an instruction execution. [7 marks]
- (b) Suppose a program includes an instruction, expressed symbolically as SUB A,B that subtracts the contents of memory location B from the contents of memory location A and stores the result in the memory location A. Explain the steps that occurs when executing the above instruction. [5 marks]
- (c) What is an interrupt? Explain how interrupts provide a way to improve the processing efficiency of computers. [4 marks]
- (d) Briefly explain two approaches to dealing with multiple interrupts. [4 marks]

- Q3.** (a) Explain the purpose of registers within a CPU. [4 marks]
- (b) Briefly explain the function of any two "Control and Status Registers" of CPU that are used to exchange data with memory. [4 marks]
- (c) What do you mean by instruction format? What is instruction length? [4 marks]
- (d) The main memory of a computer has 256K words of 32 bits each. The computer has an instruction format with four fields; an operation code field, a mode field to specify one of seven addressing modes, a register address field to specify one of 60 processor registers, and a memory address. Draw the instruction format and specify the number of bits in each field if the instruction is in one memory word. [8 marks]
- Q4.** (a) Assume a pipeline with four stages: fetch instruction (FI), decode instruction and calculate addresses (DA), fetch operand (FO), and execute (EX). Draw a timing diagram for four instructions. [5 marks]
- (b) How does conditional branch instruction affect the performance of instruction pipelining? Explain with the help of a timing diagram. [5 marks]
- (c) What are the important characteristics of RISC architecture? [5 marks]
- (d) What is the essential characteristic of the superscalar approach to processor design? [5 marks]
- Q5.** (a) Explain the function of DIV assembly language instruction. [4 marks]
- (b) Write assembly language instructions to perform the following tasks:
- Set register CX equal to zero.
  - Save the content of the memory location pointed by the register BX in register AX.
  - Test the contents of register AX and variable A.
  - Branch to the label TEST if the content of register AX is greater than or equal to the content of variable A.
  - Add one to register CX.
  - Compare the content of register CX with zero. Label the instruction as TEST.
  - Branch to the label OUT if the content of register CX is equal to zero.
- [7 marks]
- (c) Describe the following input/output operations in assembly language:
- Input a character from the keyboard.
  - Send a character to the printer.
- [4 marks]
- (d) Assume the three symbolic variables V1, V2, V3 contain integer values. Write an assembly language code fragment that moves the smallest value into the register AX. Use only the instructions MOV, CMP, and JBE (jump if below or equal). [5 marks]