

Swansea University College of Science

Prifysgol Abertawe Coleg Gwyddoniaeth

January 2018

**CSCM53**

# **Computer System Concepts**

Time Available: 2 hours

**Coordinator: Dr M Abuhmida**

*Queries:* The Exams Office hold contact details for this paper

*Dictionaries Allowed?* Available on Request

*Calculators Allowed?* Not Required

All students must attempt question 1 and one of questions 2 or 3.

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**Question 1:** *(This question must be attempted by all candidates)*

- a. How can a full adder be constructed from half adders? **[1 marks]**
- b. What can be considered as the three main aspects of information security? **[3 marks]**
- c. What is the purpose of assembler directives in the context of assembly language programming? Give two examples of directives. **[3 marks]**
- d. Define each of the following terms:
  - i File system.
  - ii Directory.
  - iii Binary file.
  - iv File extension.
  - v File Type. **[3 marks]**
- e. How would the following numbers be represented in 2's complement using 8 bits?
  - i. 57
  - ii. -48
  - iii. 48 **[3 marks]**
- f. Using 2's complement perform the calculations using 8 bit representations.
  - i.  $57+48$
  - ii.  $57-48$  **[4 marks]**
- g. Briefly explain how an 8-bit parallel adder can be constructed using full adders. Is it necessary to use 8 full adders to add two 8-bit numbers? **[4 marks]**
- h. Briefly explain how run-length encoding works and give an examples on how it might be used. Define the term compression ratio. **[4 marks]**

**Question 2:**    *(Attempt either this question or question 3)*

- a. Draw a diagram to show how a 4-channel multiplexor (which selects 1 of 4 inputs to pass to the output) can be constructed. **[3 marks]**
  
- b. How many low-level tasks can each machine language instruction perform? Define the term vertical machine. **[1 marks]**
  
- c. Compare and contrast time-sharing and multiprogramming. **[3 marks]**
  
- d. Local Area Networks (LANs) may be configured as Star, Ring or Bus networks. Define these topologies and briefly explain how messages travel in each network? **[6 marks]**
  
- e. All data is represented in binary form on computers. Discuss the various ways in which binary data can be interpreted to represent:
  - i Audio.
  - ii Video.
  - iii Photographic Images. **[6 marks]**
  
- f. Describe the standard execution cycle of a processor. What factors can influence the processing speed of a computer system as perceived by the user and briefly discuss what techniques can be used to improve the speed? Include in your answer both hardware and software approaches. **[6 marks]**

**Question 3:** (Attempt either this question or question 2)

a. What is the difference between `lossless` and `lossy` data compression? [ 2 marks]

b. What are the main functions of an operating system? [2 marks]

c. Suppose you are given the `Huffman` code for 5 letters

A	01	S	00
E	101	W	11
N	100		

Decode the following bit sequence 0011011000010101 [2 marks]

d. What do the following acronyms stands for.

i SISD.

ii SIMD.

iii MIMD. [3 marks]

e. There are three-page replacement policies, Least Recently Used (LRU), First-In-First-Out (FIFO) And Clock. Briefly, explain how each one of these strategies works. [6 marks]

f. Outline how a typical computer disk is organised in terms of tracks, sectors, blocks and cylinders. Using as an example the following sequence of ordered cylinder requests for disk access explain how First-Come First-Served (FCFS), Shortest-seektime-first (SSTF), and Scan scheduling algorithms operate assuming that initially the read/write heads are at cylinder 23 moving away from cylinder 1. Comment on the relative merits of each approach.

35 33 12 15 49 81

[10 marks]

**End of Paper**