Coursework commentaries 2015–2016

CO1110 Introduction to computing and the internet

Coursework assignments 1 and 2

General remarks

There were three questions for each coursework assignment with 100 marks available for each one.

Overall, the majority of students did well on this coursework assignment – unless where specified below – answering most questions correctly, if not always giving complete explanations for their answers.

Comments on specific questions

Coursework assignment 1

Question 1

Part (a) tested students on their understanding of the role of operating systems in managing computer resources: memory manager, process manager and peripheral manager. This part was answered correctly by the majority of students.

Part (b) was again answered correctly by the majority of students, although some completely wrong answers were seen. Some students lost marks for part (b) by not explaining their answers, although only a brief explanation was needed as in the answers below:

i. $256 \leq 2^8$, therefore 8 bits are needed.

ii. $3{,}120{,}000 \leq 2^{22}$, therefore 22 bits are needed in this case.

Part (c) tested students on their understanding of different cache memory mapping procedures: direct mapping, associative mapping and set associative mapping. This part was answered correctly by the majority of students. To score a high mark, students were required to give detailed explanations, drawing a graph to illustrate their answer.

Part (d) tested students on their understanding of the binary instruction format with four parts: indirect bit, operation code, register code and the address part. Students were asked to work out the number of bits needed for each part of computer memory with 256k words and 64 registers. The correct answer is:

1 bit for the indirect bit, 6 bits to represent the register code, 7 bits to represent the operation code and 18 bits to address one word of memory.

Question 2

This question tested students on their understanding of the concept of pipelining as well the hazards related to it. Students were expected to understand the syntax of the sequence of instructions given; namely, to understand that INSTRUCTION $rx, $ry, $rz meant perform the INSTRUCTION using $ry and $rz, and store the result in $rx.

In part (i) students were given the following sequence of instructions and asked to identify all data dependencies:

Load R4, 100(R2)

Add R5, R2, R3

Sub R6, R4, R5

And R7, R2, R5

The four instructions above contain the following data dependencies:

R6 register in Sub instruction depends on R4 register in Load instruction

R6 register in Sub instruction depends on R5 register in Add instruction

And instruction depends on R5 register in Add instruction.

In part (ii), students were expected draw a diagram of a pipeline to execute the four instructions, and to identify which of the dependencies gave rise to hazards; namely where pipeline stalls would be triggered. Students were also asked to identify the type of hazard. Students who drew good diagrams (as most did) could easily identify from their diagram that the first three dependencies gave rise to the Read After Write (RAW) data hazard; namely, where instructions are performed sequentially, one instruction reads a location after an earlier instruction has written new data to it, but in the pipeline the write occurs after the read, so the instruction doing the read gets out-of-date data.

Students were expected to address these data hazards in their diagrams by showing stalls triggered by the hazards, and then, answering part (ii), the number of cycles taken to complete the instructions could easily be read from the diagram. Most students correctly gave this as 11 cycles.

The last part of this question, (iii), required students to draw a new pipeline diagram, assuming that forwarding was used to eliminate data hazards. In this case, only 8 cycles were needed to complete the given sequence of instructions. Quite a few students struggled to answer this part of the question.

Question 3

These questions tested students' understanding of floating-point notations. Part (a) was correctly answered by the majority of students, though some incorrect answers were seen.

Coursework assignment 2

Question 1

This question tested students on their understanding of the Transport Control Protocol (TCP); how it deals with lost packets, orders incoming data correctly and manages flow of control. Parts (a), (b), (c), (d), (e) and (f) were answered correctly by the majority of students.

Part (g) was incorrectly answered by a number of students. A model answer for this part of the question is given below:

1. I/O bound processes generally spend most of their time in the waiting queue while an I/O operation is being performed.
2. When the I/O operation finally completes, it will not generally execute for a long time before it initiates the next I/O operation.
3. Therefore, they will be favoured in the the scheduling relative to long-running processes.

Question 2

In Question 2, students had to show their understanding of the concept of subnetting and its advantages. Most students correctly explained the role subnetting plays in computer networks for part (a). In part (b) students were asked to build a subnet. Students were asked to justify their answer, and many lost marks by not doing so. Students were given a network address 156.157.0.0 and were asked to segment the network into 18 different subnets. A model answer is given below:

i. This is a class B network address, so the first 16 bits are used for network ID and the remaining 16 bits are for host id. We want to have 18 subnetworks so we need to borrow some of the host ID bits. $24 < 18 \leq 25$, so we need to borrow 5 bits from the host id. Hence, the subnet mask is 255.255.248.

ii. 156.157.0.0 /21

iii. The number of host bits are $32-21 = 11$ and the number of usable host per subnets is $2^{11}-2 = 2046$

iv. The first usable subnet is:

    10011100 10011101 00001000 00000000 = 156.157.8.0

    The last usable subnet is:

    10011100 10011101 11110 000 00000000 = 156.157.240.0

    The range of the host addresses in the first subnet is:

    10011100 10011101 00001000 0000 00001 = 156.157.8.1

    to

    10011100 10011101 0000 1111 1111 1110 = 156.157.15. 254

Question 3

In this question, students were examined on their understanding of the Data Protection Act (DPA) and Computer Misuse Act (CMA).

In part (a), students had to discuss how effective the 1990 CMA has been in the fight against hacking-related offences, and why legislative reform is needed in this area.

In part (b), students were given a scenario in which a European Union (EU) company collects and sends customers' personal data to a non-EU country to be processed. Students were examined on their understanding of the measures required in order to secure and protect data from any corruption and accidental or malicious loss. A good way to tackle this question would be to list all the steps required to achieve a high level of data security. A well-structured argument, outlining the level of importance and how each of these steps could be achieved, earned students higher marks.

https://ico.org.uk/for-organisations/guide-to-data-protection/principle-8-international/