AQA

AS LEVEL
COMPUTER SCIENCE

7516/2 Paper 2
Report on the Examination

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Question 1.1

Over three-quarters of students answered this question well giving both a description and an example of a negative whole number.

Question 1.2

For this question most students correctly described an irrational as a number that cannot be written as a fraction. The most common incorrect answer was students describing irrationals as infinite. This is not enough as an infinite decimal such as 0.33 recurring can be represented as 1/3, so is not irrational.

Question 1.3

This question was badly answered with less than a quarter getting both marks. This was mostly due to students filling in more than one lozenge per column, despite clear instructions in the question.

Question 2.1 and 2.2

Both these conversion questions were very well answered with over 90% of students getting the marks.

Question 3.1

Only half the students got both marks for this question. The most common incorrect answers were students giving 65536 (or 2^{16}) as the highest and 1 as the lowest.

Question 3.2

It was very encouraging to see many students attempting the full binary multiplication. There were no marks for the correct answer without relevant working as we were assessing their application of the process. Some students did not fill in the 0s at the end of each partial product which was not penalised this time but this may not be the case in the future (10101__ is not the same number as 1010100.)

Question 4.1

Too many students were too vague with their responses, many simply stating “a code for a character” which only restates the question so is not markworthy. Some incorrectly gave the definition of a character coding set.

Question 4.2

This question about ASCII and Unicode has been asked before and was very well answered with over two-thirds of students getting both marks. However, not many students realised that the move to Unicode was due to increased international communication and most simply mentioning use of different languages which (although markworthy this time) is not really enough for AS level. The most common incorrect responses described the advantages of Unicode rather than **why** Unicode was introduced.

Question 4.3

Less than half of the students got both marks. Responses were too vague failing to describe the full process and instead stating “checking the number of 1s” instead of describing summing or counting 1s.

Question 4.4

Over 90% of students were able to correctly calculate the missing parity bit.

Question 4.5

This question needed students to convert letters to binary and then perform a Vernam cipher by XORing the binary with the key. Only half the students achieved all 3 marks. Many students only did the ASCII conversion and did not attempt the Vernam cipher. A common misconception was students adding the key instead of XORing. A small number of students failed to attempt this question when they could have done the ASCII conversion for one accessible mark.

Question 5.1

Over half of the students correctly recalled the definition for analogue and digital data. Reponses that did not gain full marks were too vague.

Question 5.2

This question about the operation of an ADC is a topic that has been asked in previous papers. However, less than a quarter of students got full marks, with many of the rest failing to describe sampling the *signal*. Instead, students described “sampling the sound wave” which is incorrect as the sound wave becomes an electrical signal inside the ADC and that is what is sampled.

This year we accepted that an ADC measures the *height* of each sample. However, it is more correct to describe the *amplitude* (or voltage) of the signal being approximated to an integer value during the quantisation stage.

Question 6.1

Almost two-thirds of students achieved this mark. The most common incorrect answer defined software as “virtual or intangible part of a computer” which is too vague. Some students also described “apps” and failed to include systems software.

Question 6.2

Over half of students achieved both marks by correctly stating two other types of system software. Far too many students gave types of translators (interpreters, compilers or assemblers) in their answers despite the question asking for “two other types”. Other incorrect responses included describing OS functions, eg memory management.

Question 6.3

This question was about **how** an Intermediate Language (IL) is used and was badly answered with a third of students scoring no marks (and 1 in 8 students not attempting it at all.) The best answers showed an understanding that further translation of the IL was required and that this could be done using a virtual machine or JIT compiler.

Question 6.4

This question was about **why** Intermediate Language is used and was also badly answered with only half the students getting a mark. The most popular response recognised that IL could be used cross-platform as it was processor independent.

Question 7.1 and 7.2

Both these questions were very well answered with approximately 90% of students correctly stating the logic gate.

Question 7.3

Questions like this involving drawing logic circuits have been in previous exam papers and this was well answered with three-quarters of students scoring at least one mark and well over half getting both marks. Some students tried to simplify the Boolean expression before they drew the logic circuit which was not needed.

Question 7.4

Over three-quarters of students were able to complete the truth table gaining two of the three marks, but not all could see that this equated to `A.B` and tried to simplify the Boolean expression using laws and identities.

Question 7.5

Simplifying Boolean expressions has been assessed on previous papers and this was a relatively simple simplification. However, less than a third of students got full marks, with many of those who did not multiplying out the brackets incorrectly. In this question one half of the expression was an AND and the other was an OR. When multiplying out the brackets many students incorrectly placed an OR between all parts, eg $A \cdot A + A \cdot \bar{B} + \bar{B} \cdot A + \bar{B} \cdot \bar{B}$ instead of $A \cdot A \cdot \bar{B} + \bar{B} \cdot A \cdot \bar{B}$. Students need to have practiced on a large variety of expressions.

Question 8.1

Almost 90% of students correctly identified the order of the fetch-execute cycle scoring full marks.

Question 8.2

Less than a quarter of students got full marks on this question: often the responses of those who did not were simply not enough, eg “stores data” instead of describing the storage of *instructions* for the execution of programs. Students need to make sure they respond in the context of the question, in this case the role of RAM in the execution of programs.

Question 8.3

This question was well answered with over three-quarters of students correctly identifying the ALU as the processor component responsible for mathematical operations. The incorrect answers suggested that some students did not know what a processor component was.

Question 8.4

Over half the students gained this mark for explaining how increasing the data bus width improves processor performance. However, too many students were not specific enough with their answers and did not make it clear that more data / bits could be transferred *at once / simultaneously*.

Question 8.5

This question was about which bus to change to double the amount of memory and was badly answered with less than a third of students gaining both marks. There was a surprisingly large number of students that did not even attempt an answer when they could have simply picked the name of one of the three buses to change.

Question 9.1

Almost three-quarters of students correctly identified the instruction that used immediate addressing.

Question 9.2

Previous exam papers have included questions on writing an assembly language program so students should have been prepared. This question was straightforward with only one branch and no loop, and half the students gained at least three of the four marks. However, very few students gained full marks as they often omitted to store the content of the register back to memory location 101.

Other common errors included:

- using memory addresses directly in commands instead of registers eg `CMP 101, #50`
- using a branch without a label.

Question 10.1

This question on stop and start bits was the worst answered question with over three-quarters of students scoring 0 marks. Most students simply stated the bits stopped and started transmission which is not enough to describe the purpose. Students should be more precise describing the start bit as synchronising the clocks of the transmitter and receiver. Likewise, the stop bit is there to allow the receiver to recognise the transition to the next start bit.

Question 10.2 and 10.3

These two questions assessed the students' knowledge of protocols and latency. Over two-thirds of students defined these well.

Question 10.4

This question was about how a physical star topology can behave logically as a bus network. This is a difficult topic and has not appeared on many exam papers. As a result, it was badly answered with three-quarters of students gaining no marks.

The mark scheme this year accepted "hub transmits data to all devices" but this is a little out of date as most modern networks use switches not hubs. The best answers discussed using a bus transmission protocol to make a switch create temporary buses between two nodes of the star network.

Question 11

This extended answer question was on smart speakers, the ethical / legal / cultural issues they might pose and lossy compression. It was well answered with over two-thirds of students gaining at least half marks. Students were able to write at length about ethical / legal / cultural issues as these have been well covered on previous papers and mark schemes. Some of the better responses included discussions on how smart speakers might impact different cultures or subsections of society, eg discussing how the speakers might respond to different accents and languages or how some cultures might not want their religious practice or prayers recorded.

A common mistake was to assume that lossy compression would take away 'detail' in the recording which would anonymise the recordings to make them unrecognisable. Another similar

misconception was that lossy compression would remove background noise or silences in the recordings. This shows that some students did not fully understand that lossy compression (eg MP3) only removes parts that are inaudible so the difference in quality is not noticeable to the human ear.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.