A LEVEL
Computer Science

Paper 2

Report on the Examination

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Question 1.1
This question part was well tackled with just over three quarters of students correctly identifying that 30A was the highest number.

Question 1.2
This question part was satisfactorily tackled but only approximately half of students got both marks. Common mistakes were to shift the binary point in the wrong direction or to treat the exponent as an unsigned integer instead of as a two's complement value.

Question 1.3
Approximately half of the students achieved full marks on this question part. The vast majority were able to write an unsigned representation of 608 as an integer. Some students then made an error when converting this to -608, for example by simply flipping the bits or making simple errors like missing out a digit. The most common mistake however was to incorrectly shift the binary point when attempting to normalise the value. Often an exponent of 9 was given instead of the correct value of 10 and sometimes -10 was given.

Question 2.1
Just under half of the students achieved two of the three marks on this question part but only around 10% achieved all three. Students needed to explain that a vector graphic system represents an image as a set of objects and that properties of these objects would be stored. It was not considered creditworthy to say that vector graphics were represented by equations. When stating properties of the black rectangle students had to be specific. For example, "coordinates" was not accepted as it would be the x and y coordinates of a specific point eg the top left corner of the rectangle that would be stored.

Question 2.2
Almost all students achieved at least one mark for this question but only just over half achieved both marks. The mark given to most candidates who only scored one mark was for calculating the number of pixels in the image by multiplying 50 by 50. The two most common mistakes were to multiply the number of pixels by the number of colours in the image (4) instead of the colour depth (2) or to express the answer in bits instead of bytes.

Question 2.3
Just under half of the students achieved full marks for this question. Many students chose to state how the particular row of pixels might be encoded using RLE but the associated descriptions of how RLE worked were often less good. For example, a student might state that the run lengths needed to be stored and not mention that the pixels colours also needed to be stored. Students needed to make clear that the pixel counts refer to adjacent pixels of the same colour and are not, for example, simply a count of yellow pixels.

Question 2.4
Approximately 90% of students achieved a mark by recognising that the second image could not be compressed very effectively because it contained many more colours and so very short runs of the same colour. Only a small minority went on to develop this response by discussing the fact that adding the run lengths into the image representation might counter any memory savings as a result of representing some runs.

Question 3.1
This question part was well answered with just under three quarters of students fully completing the truth table for the logic circuit. The most common error made by those who did not was either failing to recognise the symbol for the XOR gate or not knowing the correct logic for this gate.

Question 3.2
Over two thirds of students achieved full marks for this question part by correctly writing a Boolean expression for the circuit. Common mistakes were to miss out brackets or add in brackets which affected the order of evaluation and made the expression incorrect or to use an incorrect symbol for XOR. Responses may be written using the words AND, OR, XOR etc if a student prefers this to using the Boolean algebra symbols.

Question 3.3
Just under half of the students recognised that the circuit was a full adder. A common incorrect response was that it was a flip-flop.

Question 4
A very good range of responses was received to this question, with approximately half of students achieving five or more marks. Most students addressed all three aspects of the question (hardware, network, database and software). Students tended to make more points about how the hardware could be improved than about the other two areas. This was acceptable but students needed to have covered all three areas to achieve a mark of ten or above.

Some students wrote too vaguely to achieve marks, for example by writing that a “faster processor” would improve performance, without referencing a factor such as the clock speed that would make the processor faster. Other mistakes included believing that the question required students to contrast thin-client and thick-client and that the system was web based.

A small number of students wrote about issues which might be causing the system to perform poorly instead of explaining how the performance of the system could be improved. Such responses were not worthy of a mark.

Question 5.1
For this question part students had to express a subnet mask in binary, with 5 bits allocated to the Host ID. Only a quarter of students were able to do this successfully. Common errors were to write the IP address of the external router instead of the subnet mask or to write the subnet mask out backwards.

Question 5.2
For this question part students had to calculate how many devices could be connected to the subnet with 5 bits allocated to the Host ID. The correct answer was 30 devices as two of the possible 32-bit patterns that could be represented with 5 bits are reserved. On this occasion any answer in the range 30 to 32 was accepted as this showed some understanding, but students should note that in the future only the precise answer will be accepted for this type of question.

Question 5.3
Approximately half of the students were able to provide some explanation of the DHCP system. The most common incorrect responses related to DHCP being a security system that controlled access to a network.

Most students who tackled the question successfully recognised that the purpose of the DHCP system was to allocate IP addresses to devices; fewer explained that other attributes such as the subnet mask were also allocated. The most commonly given reason for why this was useful was because there was a limited pool of IP addresses and this system allowed for them to be reused when they were no longer required.

The contents of the communication between and a device and a DHCP server were less well known, with just over 10% of students achieving more than two of the four available marks.

Students who wrote about the communication often did not appreciate that the request for a configuration was not made directly to a specific DHCP server but was broadcast or that the server returned an offer of a request, rather than simply allocating the configuration immediately that the request was received.

Question 5.4
The use of port forwarding to provide access to a web server within a network from outside it was not well understood. Only around a fifth of students achieved a mark on this question part. Some students provided generic descriptions of network address translation or wrote too vaguely, not referencing key terms like port and IP address in their responses. Good responses identified that traffic arriving at the web services port of the external router would be forwarded to the web server using its IP address.

Question 6.1
The vast majority of students showed some understanding of how optical disks worked, with over three quarters achieving some marks, but relatively few showed a good understanding, with only a fifth of students achieving more than half marks. Most students were aware that the data on the disk was read using reflected laser light, but descriptions of how the data was represented on the disk were less good. A small number of students wrote about magnetic disk storage instead or a device that sounded like a record player.

Question 6.2
Just over three quarters of students achieved a mark for explaining a reason why USB Flash Drives were a more popular choice the CD-Rs for transferring data. Good responses included reasons such as higher storage capacity, re-writability and the fact that no drive is required. Some points required further explanation than students gave to achieve a mark, for example points about robustness, as arguments could be made both ways about whether a Flash Drive or CD-R is more robust. When discussing capacity, students are advised to use the word “capacity” instead of the word “large” which could be a reference to the physical size of the device.

Question 7.1
Over three quarters of students achieved some marks for completing the E-R diagram, with approximately a third achieving some marks. A straightforward way to determine the nature of the relationships is to identify which attributes are used to link the relations and in which relation such an attribute is the entity identifier/primary key and in which it is a foreign key.

Question 7.2
Good responses to this question part recognised that the data types and fieldnames were in the wrong order and that the primary key had no data type. Two thirds of students identified at least one error and just over a quarter identified two.

Question 7.3
Over half of students achieved some marks for this question. The most common valid responses referred to the elimination of data redundancy and data inconsistency.

Question 7.4
This question received a wide range of responses, with four fifths of students achieving some marks but only slightly over 10% achieving full marks. The most commonly achieved mark was for including the condition that identified records for the correct date. It was pleasing to see how many students were also able to identify the conditions required to join the tables. Common errors were failing to include all of the required tables in the FROM clause and missing out delimiters around the date.

Question 8
Around half of students achieved some marks for this question, but full mark responses were seen very infrequently. Good responses recognised issues such as the fact that the Internet crosses borders but laws typically relate to only one country or that technology changes very quickly so it is difficult for legislation to keep up. Some students just listed Acts of Parliament in the UK rather than addressing the challenges and a minority did not understand the term legislator, believing a legislator to be an employee of a company.

Question 9.1
This question was well tackled, with over 80% of students achieving some marks and about half achieving both marks.

Question 9.2
This question was well answered. Three quarters of students were able to identify that an ordinal number was used to specify the position of an item in a list and the majority of these then went on to explain that in the context of the array the index was an ordinal number. The most common misunderstanding was to believe that an ordinal number referred to the length of an array.

Question 10
This is the first time that students have been asked to produce a proof that two Boolean expressions are equivalent. It was well tackled, with over 40% of students achieving full marks. A common mistake was to believe that $D + \overline{D} = 0$.

Some responses were difficult to mark as the way that students laid them out made it unclear what order they had done things in. It is particularly important when presenting a proof that the examiner can see what steps the student took and in what order these were made. In other responses, students would miss out steps, making jumps in their working that were not convincing enough to be a proof.

Question 11.1
Approximately a third of students correctly recognised that the sample resolution was 4 bits as there were 16 different levels that could be recorded. Some students failed to achieve the mark as they wrote 4 but did not specify that this was a number of bits.

Question 11.2
Nearly three quarters of students were able to calculate that the sample rate was 1000Hz, or alternatively 1kHz.

Question 11.3
This question was well tackled. The vast majority of students could explain that the difference between the amplitude of the waveform and the recorded value would result in the reproduced sound containing a distortion. Many did then go on to say that this distortion could be improved by having more bits for the sample resolution. The most common mistake was to assert that increasing the sample rate would resolve the issue.

Question 11.4
Nyquist's theorem was well known and three quarters of students correctly calculated that the minimum sample rate needed to be 2400Hz. The most common error was to divide 1200 by 2 and give an answer of 600Hz.

Question 12.1
Nearly three quarters of students were able to explain the purpose that the registers were used for. The most common error was to mix up the purpose of registers R2 and R3.

Question 12.2
Around 40% of students correctly identified that the missing instruction was MOV R3, R1. Common mistakes were to use the STR or LDR command instead and some students reversed the order of R3 and R1.

Question 12.3
This question part was well tackled. Over 60% of students achieved at least 2 of the 3 marks for including appropriate comparison and subtraction commands in their code. However, only slightly over 10% achieved all 3 marks. Most students correctly identified the required comparison and subtraction commands but failed to make the appropriate branches to achieve a fully working solution. The most common problem was to fail to jump over the command at position 1 after completing the code, thus undoing what the code achieved.

Question 13.1
This question was about securing the connection from a wireless device to a wireless access point. Just over half of students achieved some marks. Good responses suggested the use of measures such as not broadcasting the SSID or setting up a MAC address whitelist. Some students lost marks by focussing on general security measures such as login systems or a firewall instead of the security of the access point. Others stated appropriate measures but did not explain how they would make the connections more secure, which was required to achieve the marks. It is important to note that a WPA2 key is an encryption key used to encrypt transmitted data and not a login password.

Question 13.2
A broad range of responses were made to this question. Over half of students achieved at least three of the six marks, with approximately 10% achieving full marks. The most common point of confusion related to how a communication started, with many students believing that the first step in the communication was the transmission of a request to send signal, missing out the monitoring of the wireless channel by the transmitter to check if the channel was idle. Some students confused CSMA/CA with CSMA/CD, believing that the system would detect collisions that occurred. Few described the acknowledgement system or explained that the RTS and CTS signals would block other transmissions.

Question 14.1
Properties of big data were fairly well known, but students sometimes lost marks by expressing them poorly. The question asked for a description and keywords such as “velocity” do not amount to descriptions. Some students lost marks by giving the example stated in the question as one of their responses.

Question 14.2
The graph schema was well drawn, nearly three quarters of students achieving two or more marks, and a third all three marks. The most common mistake was to fail to label relationships.

Question 15.1
The majority of candidates correctly identified that two of the functions made use of a higher-order functions.

Question 15.2
This question was very well tackled. Nearly 60% of candidates achieved two of the three marks and a third full marks. The most common mistake was to include brackets to indicate that a value was in a list when it was not or vice-versa.

Question 15.3
Nearly two thirds of students were able to explain that the function call calculated the total revenue generated in one day. Whilst not correct from an accounting point of view, answers that referred to the total profit were also accepted.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator