COMPUTER SCIENCE

Paper 0478/11
Computer Systems

Key messages

It would be beneficial for candidates to show a greater use of technical terminology in their responses. It would also be beneficial for candidates to note the key terms given in a question and structure their response based upon these. Candidates should note that any context given in a question should be used in the answer, and their answer should be applied to the given context.

General comments

Candidates and centres are reminded that written papers are scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also, if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

Question 1

(a) Most candidates were able to identify that a keyboard is an input device.

(b) Most candidates were able to identify that a printer is an output device.

(c) Many candidates gave the correct response. Some students incorrectly gave the CPU as a response.

(d) Few candidates were able to accurately describe what is meant by the clock speed. Many candidates gave a describe description such as it is the speed at which the CPU runs.

(e) (i) Many candidates were able to state that the MDR stores data. Few candidates were able to expand their description with further detail.

(ii) Many candidates were able to give three correct registers. The most common incorrect answer was arithmetic logic unit.

Question 2

(a) Most candidates were able to calculate the correct cost.

(b) Most candidates were able to provide the correct binary values.

(c) Many candidates were able to provide a correct hexadecimal number. Some candidates tried to convert the binary to denary instead of hexadecimal.

(d) Few candidates were able to explain an accurate and technical answer about why the data needs to be converted to binary. Most gave a vague reference to it being what the computer understands. It would be beneficial for candidates to have an improved technical understanding of why data needs to be converted to binary for a computer.

(e) Few candidates were able to describe the role of the microprocessor in the system. Most candidates gave a vague description about data being sent to the microprocessor and the data being converted to binary. They gave little or no detail about the actual role of the microprocessor.

Question 3

Most candidates were able to give the correct answer for hardware and operating system. Few candidates were able to give the answer for application software and firmware. The most common incorrect answer was firmware.

Question 4

(a) Some candidates were able to Identify serial half-duplex as a correct method of transmission. Few candidates were able to identify serial full-duplex as a correct method of transmission. The most common incorrect answer was serial simplex.

(b) Some candidates were able to give a detailed and technical description about an odd parity check. The most common details missed were adding the parity bit to each byte and stating the data was checked again after transmission.

(c) Many candidates were able to give the correct error detection method.

Question 5

(a) Very few candidates were able to provide and accurate and technical description about how the sound is converted to digital. Most candidates gained a mark for stating that a microphone would be used to record the sound, but few candidates could give information beyond this point. It would be beneficial for candidates to have a greater understanding of converting analogue sound to digital.

(b) Few candidates were able to give any indication about how the accuracy of the recording could be increased.

(c) Many candidates were able to describe why lossless was the best option. Most referred to the loss of quality that lossy would create.

(d) Some candidates were able to give a detailed explanation about the differences. Most referred to Unicode having more characters. Some expanded on this to state it could cover more languages.

Question 6

Very few candidates were able to create a diagram that represented how a firewall works. Most drew a firewall and a computer and a vague statement about how the firewall blocks malicious traffic. Very few drew or annotated any representation of how this happened though.

Question 7

Many candidates were able to select the correct missing term to complete the statements.

Question 8

(a) Most candidates could give at least one feature of magnetic storage. The most common feature given was that it has platters. It would be beneficial for candidates to have an improved understanding of how electromagnets are used in magnetic storage. Some candidates gave brief states such as it uses magnets.

(b) Few candidates could give features of solid-state storage. The most common correct answer was that it uses transistors. It would be beneficial for candidates to have an improved understanding of the features of solid-state storage.

(c) Many candidates were able to give a correct example of each type of storage. Some candidates were too vague in their example such as USB. Candidates must make sure their response is specific such as a USB drive.

Question 9

(a) Some candidates were able to give the correct software. The most common incorrect answer given was CPU.

(b) Very few candidates could give an accurate technical description about how interrupts are used. Most candidates gave a vague statement about a key being pressed and analogue data being converted to digital data. It would be beneficial for candidates to have an improved understanding of the role of interrupts and how they are used.

(c) (i) Many candidates were able to provide at least one correct hardware interrupt. Quite a wide variety of hardware interrupt examples was seen from candidates.

(ii) Many candidates were able to provide at least one correct software interrupt.

COMPUTER SCIENCE

Paper 0478/12
Computer Systems

Key messages

It would be beneficial for candidates to show a greater use of technical terminology in their responses. It would also be beneficial for candidates to note the key terms given in a question and structure their response based upon these. Candidates should note that any context given in a question should be used in the answer, and their answer should be applied to the given context.

General comments

Candidates and centres are reminded that written papers are scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also, if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

Question 1

(a) Most candidates were able to select the correct option.

(b) Most candidates were able to give another type of malware. The most common incorrect answers were anti-malware and anti-virus.

(c) Many candidates were able to give the correct type of software.

Question 2

(a) Most learners were able to give the correct denary value.

(b) Most learners were able to give the correct hexadecimal number.

(c) Many candidates were able to correctly complete the binary shift. The most common incorrect answer was from candidates who performed the binary shift to the right and not the left.

(d) Some candidates were able to show suitable working and the correct answer. Some candidates only demonstrated partial working. Candidates are reminded to include all the working they do in their response.

(e) Some candidates were able to add the two binary values and clearly showed that there was an overflow from the result. Some candidates had only shown that they had converted the values to denary, added them and then converted the result to binary. Candidates are reminded that this is not a valid method of working as the question requires binary addition to be used.

Question 3

(a) (i) Few candidates were able to accurately state what is meant by the clock speed. Many candidates gave a describe description such as it is the speed at which the CPU runs.

(ii) Most candidates were able to state that it would increase the performance of the CPU. Few candidates were able to expand upon why this would happen.

(b) Many candidates were able to state that the MAR stores addresses. Few candidates were able to expand their description with further detail.

(c) Some candidates were able to identify the list of commands as an instruction set. Some candidates gave the answer mnemonics. These are used in an instruction list but are not accurate for the name of the list.

Question 4

(a) Most candidate could give at least one characteristic of an embedded system. The most common correct answers were that it performs a specific function and it has a microprocessor.

(b) Many candidates were able to identify the three correct examples.

Question 5

(a) Many candidates were able to give a suitable benefit.

(b) Many candidates were able to give a suitable drawback.

(c) Few candidates were able to provide an accurate description sample resolution. The most common incorrect answers describe sample rate instead of sample resolution.

(d) Most candidates were able to identify the correct compression method.

Question 6

Many candidates were able to give the correct transmission methods. Some candidates only gave part of the transmission method used. For example, they gave serial data transmission instead of stating it was serial simplex transmission.

Question 7

(a) Many candidates were able to provide at least one suitable input device. The most common correct answer was barcode scanner. Some candidates were too vague in their answer just stating scanner.

(b) Few candidates were able to provide an accurate and technical explanation of how the sensor and microprocessor would be used. Many candidates gave a very generic response with little or no reference to the context. Candidates are reminded to apply any context given in a question to their answer.

Question 8

(a) Few candidates were able to provide an accurate diagram about the process of data interception. Many candidates demonstrated the data being transmitted from one device to another. They also demonstrated that a third party intercepted the data mid transmission. Very few candidates referred to the data packets being examined by a packet sniffer.

(b) Some candidates demonstrated understanding that encryption could help keep the data safe. The most common incorrect answer was firewall; however, a firewall cannot help keep the data safe mid-transmission.

Question 9

Many candidates were able to complete the correct terms but few candidates were able to provide correct descriptions.

Question 10

(a) Many candidates were able to give a characteristic of AI. The most common correct answer was the ability to learn.

(a) Very few candidates were able to provide a fully accurate and technical description about how an expert system operates. Some candidates were able to name some or all of the components involved but very few could describe their role in the process. It would be beneficial for candidates to have a greater understanding of how an expert system operates.

Question 11

(a) Many candidates were able to state what a flow sensor measures. Some responses lacked detail stating it measures the flow, but no reference to the amount of flow or the flow of what kind of material.

(b) Some candidates were able to provide a relevant advantage. Many candidates did not provide an advantage in context of the question. They provided advantages such as they can work 24/7. However this would not be an advantage the employee.

(c) Many candidates were able to provide a relevant disadvantage. Most referred to high setup or maintenance costs.

Question 12

(a) Many students were able to give at least one feature of a digital currency. The most common correct answer was that it is a decentralised system.

(b) Many candidates were able to identify the correct name for the process.

Question 13

(a) (i) Most candidates were able to identify the correct example.

(ii) Many candidates were able to give a correct characteristic. Some candidates stated that primary storage is volatile. This answer was incomplete as primary storage is both volatile and non-volatile.

(b) Many candidates were able to select the correct missing terms.

COMPUTER SCIENCE

Paper 0478/13
Computer Systems

Key messages

It would be beneficial for candidates to show a greater use of technical terminology in their responses. It would also be beneficial for candidates to note the key terms given in a question and structure their response based upon these. Candidates should note that any context given in a question should be used in the answer, and their answer should be applied to the given context.

General comments

Candidates and centres are reminded that written papers are scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also, if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

Question 1

(a) Most candidates were able to give two suitable input devices. The most common correct answers were touchscreen and microphone. The most common incorrect answer was speaker.

(b) Many candidates were able to give a correct output device. The most common correct answer was speaker. Some candidates gave headphones as a response; however these were not relevant as they are not built into the device. Some candidates gave printer as a response which was not relevant to the context. Candidates are reminded to make sure they provided answers relevant to the context given.

(c) (i) Most candidates were able to give the correct value.

(ii) Many candidates were able to give the correct value.

(d) Few candidates were able to provide a detailed and accurate description of the purpose of an operating system. Most candidate gave functions of an operating system but gave little detail beyond this.

Question 2

(a) Most candidates were able to provide an accurate explanation.

(b) Most candidates were able to provide the correct converted values.

(c) Many candidates were able to provide the correct hexadecimal values.

(d) Some candidates were able to show suitable working and the correct answer. Some candidates only demonstrated partial working. Candidates are reminded to include all the working they do in their response.

(e) Some candidates were able to correctly add the two binary values. Some candidates had only shown that they had converted the values to denary, added them and then converted the result to binary. Candidates are reminded that this is not a valid method of working as the question requires binary addition to be used.

Question 3

(a) Many candidates were able to circle the correct three components. The most common incorrect answer was RAM.

(b) Many candidates were able to provide a correct explanation of cache.

(c) Some candidates were able to name the correct component. The most common incorrect answer was the control unit.

(d) Most candidates were able to name the correct component.

Question 4

(a) Some candidates were able to explain the purpose of a web browser. Many candidates gave features or functions of a web browser instead of explaining its purpose.

(b) Many candidates were able to identify the correct function.

(c) Many candidates were able to identify the correct function.

(d) Many candidates were able to identify that encryption would be used.

Question 5

(a) Many candidates were able to identify a correct reason for an error occurring. The most common correct answer was interference.

(b) Most candidates were able to identify the correct error detection method.

(c) Some candidates were able to provide a detailed and technical explanation of how a positive ARQ operates. Many candidates described both the positive and negative methods, often mixing them together. Candidates are reminded to take note of the context given in the question and use this in their response.

Question 6

(a) Many candidates were able to correctly identify which characteristic was not cloud storage.

(b) Some candidates were able to explain at least one advantages. The most common advantage given was the ability to access the data from any location. It would be beneficial for candidates to have further understanding of the advantages of cloud storage.

(c) Many candidates gave a suitable disadvantage. The most common correct answer was about an internet connection being required.

Question 7

(a) Many candidates were able to state what is meant by image resolution.

(b) Some candidates were able to state what is meant by colour depth.

(c) Many candidates were able to give a correct benefit. The most common correct benefit was that the image will have more detail.

(d) Most candidates were able to identify the correct compression method.

(e) Many candidates were able to give at least one benefit of compressing the image. The most common correct answers referred to quicker transmission.

Question 8

Few candidates were able to draw and annotate an accurate diagram. The most common mark awarded was for the router sending packets towards their correct destination.

Question 9

(a) Some candidates were able to give the correct types of secondary storage. The most common correct answers were for optical storage.

(b) Some candidates were able to describe two differences. The most common incorrect difference given is that primary storage in volatile and secondary storage is non-volatile.

Question 10

(a) Many candidates were able to select the correct missing terms.

(b) Very few candidates were able to give an accurate explanation of what is meant by machine learning capabilities. It would be beneficial for candidates to have a greater understanding of machine learning capabilities.

COMPUTER SCIENCE

Paper 0478/21
Algorithms, Programming and Logic

Key messages

Candidates should ensure they understand the published pseudocode within the syllabus as this is the basis for the initial set of questions within the paper. Practice for the large programming task would be beneficial to candidates. Candidates also need to use the correct flowchart symbols and to practise trace tables.

General comments

Candidates using additional pages are reminded to clearly indicate the question for which they are providing a further response. Candidates need to write their name and candidate number clearly on any additional pages.

Comments on specific questions

Question 1

Most candidates were able to correctly identify the correct operator.

Question 2

Some candidates were able to identify parameter as the correct answer.

Question 3

Some candidates indicated the correct description to the data type. Some candidates demonstrated a lack of understanding of the primitive data types.

Question 4

Many candidates were able to identify two data stores with a few identifying all three.

Question 5

(a) Many candidates demonstrated a lack of understanding of the term abstraction and its application.

(b) Only a minority of candidates correctly identified the main component parts of a problem.

(c) Many candidates correctly identified another stage of the life cycle.

Question 6

(a) Few candidates identified that the algorithm sorted the names with even fewer identifying it was a bubble sort.

(b) Candidates did not answer this question well. Many provided sections of the pseudocode in their answer instead of identifying the processes in the algorithm.

(c) Candidates did not answer this question well. Candidates who did not understand that the algorithm sorted an array of names struggled to identify suitable identifiers.

(d) Most candidates did not understand the methods of making an algorithm easier to understand and maintain. Some answered by using suitable variable names which was the question in **(c)**.

Question 7

(a) The majority of candidates correctly answered this question.

(b) The majority of candidates correctly completed the truth table.

Question 8

(a) Most candidates correctly identified that a range check was required.

(b) There was a mixed response to this question. Stronger candidates knew the correct flowchart symbols and arrows to use.

(c) Only a few candidates correctly gave two sets of input data for the algorithm. Many candidates did not attempt this question.

(d) This question was not answered well with many candidates not attempting the question.

(e) This question was not answered well with many candidates not attempting the question.

Question 9

(a) Most candidates correctly answered this question. Some candidates used string as a data type in a database instead of text.

(b) (i) Candidates answered well if they correctly gave a name in **(a)**.

(ii) Most candidates were able to recognise that the field would be unique.

(c) In most cases, candidates could not state the purpose of the three main parts of an SQL statement.

Question 10

Candidates were asked to meet three requirements:

R1 Find number of seats available for each performance and output (searching, nested iteration, output)
R2 Inputs and validates number of seats (input, iteration, and selection)
R3 Checking if seats available (selection, assignment, output with appropriate messages)

Many candidates did not attempt this question.

Requirement 1 was not attempted well by most candidates as they did not use nested loop or use a 2D array as stated in the question.

Requirements 2 was met by most candidates.

Requirement 3 was met by only a few candidates as the output only stated the number of seats booked by a person without identifying whether there were any available and which seats had been booked.

Only a very few candidates achieved all aspects of each requirement.

COMPUTER SCIENCE

Paper 0478/22
Algorithms, Programming and Logic

Key messages

Candidates who read the questions carefully, fully answered the questions that were asked and used the appropriate context.

Candidates who answered algorithm questions in the manner stated in the question, for example using pseudocode or a flowchart as required, achieved the best marks. Candidates who had learnt the syntax of the pseudocode as defined in the syllabus for this course, answered pseudocode questions accurately.

Candidates need to make sure that any answers they provide are appropriate for the command word used in the question. For example, questions that begin with 'Explain' will require more detail than those beginning with 'State'. In addition, explain type questions usually require an explanation of how something was done, rather than a simple description of what was done.

Candidates must ensure that they use only pseudocode, Python, Java or VB.NET when answering the final question, and they must ensure that the solution accurately follows the details given in the scenario.

General comments

Candidates demonstrated a good overall understanding of the requirements of the paper with very few questions left unanswered.

Candidates are reminded that when answering the final programming question, they should read the scenario through to the end before beginning their solution. Candidates do not need to declare variables and arrays if the scenario states that arrays and variables do not need to be declared. Candidates should proceed straight to the writing of the program, ensuring that the variables and arrays defined in the scenario are used as stated in the scenario.

Comments on specific questions

Question 1

Many candidates correctly identified verification as a value that has not changed during input. However, a significant number of candidates incorrectly selected the option that stated verification made sure that a value entered is correct.

Question 2

(a) Many candidates correctly stated format check, which was the only correct answer for this question. Other incorrect validation checks were seen, including type check and presence check.

(b) Candidates were required to give an example of normal data and an example of abnormal data that could be used to make sure the check in part **(a)** is working correctly. In each case, a reason was required. The normal data needed to be any series of digits in the format 99/99/9999 and the abnormal data could be anything that wasn't a series of digits in the given format, or anything that was an attempt at test data that wasn't a series of digits. The reasons should state why the test data was chosen, and whether or not it would be accepted. For example, for normal data: 30/12/1990 is in the correct format so it should be accepted and for abnormal data: 30/Dec/1980

the month is in the wrong format so this should be rejected. A wide range of answers were given and the full range of marks awarded.

(c) Candidates were asked to describe how a length check could be used as a further validation check for a date that had been entered. Many candidates correctly stated that this check would ensure that the date was 10 characters in total (if the slashes are included). Some candidates went on to expand the answer to state that if the answer was not the correct length, it would be rejected, and achieved the second mark. A significant number of candidates did not answer the question in the correct context and incorrectly wrote about checking the length of a password, which was not part of the question.

Question 3

(a) Most candidates achieved high marks. These candidates linked the pseudocode statements to their most appropriate use.

(b) A wide range of marks was seen for this question. Many candidates achieved some marks. Candidates did generally find this question difficult. Candidates are advised to practice writing algorithms, making use of the pseudocode guide provided in the syllabus.

Question 4

(a) A good range of marks was seen for this question. Most candidates identified and corrected at least one error in the given algorithm. A significant number of candidates achieved high marks.

(b) Candidates were required to describe how the algorithm could be changed for the reason stated in the question. This required a written response that described specific changes made to the algorithm and where these changes would be made. Many candidates incorrectly only rewrote the algorithm, which was not required, or gave answers that were too vague.

Question 5

This question was answered well, with most candidates achieving at least two marks for explaining how variables and constants should be used when creating and running a program.

Question 6

(a) This trace table question was answered well and many candidates achieved full, or near full marks. Common errors including not initialising totalling or counting variables in the trace table or adding incorrect punctuation such as extra commas or quotation marks to the output.

(b) Candidates who described the algorithm as adding together a batch of numbers, or similar, achieved a mark. Candidates who then stated that this total along with the average of the numbers was output, achieved both marks.

Question 7

Candidates appeared to find this question difficult. A wide range of marks was seen with some candidates achieving high marks.

Question 8

Some answers seen for this question were well written, with many candidates achieving at least one mark. Some provided long answers that gave the definition of a procedure but didn't explain why a programmer would use them when writing a program.

Question 9

(a) A well answered logic circuit question. Most candidates achieved some marks. Many candidates achieved high marks.

(b) Most candidates answered this question well. A significant number of candidates made some errors when working through the logic expression, leading to incorrect outputs.

Question 10

(a) Candidates who correctly stated that the given table had 18 rows achieved the mark. Some candidates incorrectly stated the number of columns and others incorrectly stated the number of rows including the header row.

(b) Most candidates correctly identified `Code` as the primary key field and most of these candidates stated the reason for its choice was that it was a unique identifier.

(c) Most candidates answered this question well. They correctly identified suitable data types for the given fields.

(d) This question achieved a mixed set of results. Most candidates achieved at least one mark. Other candidates achieved all the marks for completing a structured query language statement for the stated query.

Question 11

Candidates were required to complete an extended program using pseudocode, Python, Java or VB.NET to meet a set of requirements given in a scenario based on an online ordering system for wood flooring materials, including inputting the dimensions of a room, calculating the floor area and working out the cost of the wood required.

A wide range of quality of responses was seen, with most responses using either pseudocode or Python, but a small number of Java and VB.NET solutions were also seen.

The full range of marks was awarded, with many candidates achieving high marks. Candidates whose responses closely matched the requirements stated in the scenario, ensuring that all points were fully covered, achieved the highest marks.

Candidates who achieved full or near full marks also followed the remaining guidance at the end of the scenario well. This included the comprehensive use of comments to explain what each part or sub part of the solution was doing and the use of appropriate messages to accompany all inputs and outputs.

The best responses also correctly used all the data structures given in the scenario in the way they were expected to be used as stated in their descriptions.

COMPUTER SCIENCE

Paper 0478/23
Algorithms, Programming and Logic

Key messages

It would be beneficial to candidates to fully understand the published pseudocode within the syllabus as this is the basis for the initial set of questions within the paper.

General comments

Overall, the paper was answered well. Candidates were able to demonstrate a good level of understanding of algorithms and programming.

Candidates using additional pages are reminded to clearly indicate the question for which they are providing a further response. With the additional pages the candidates need to write their name and candidate number clearly on any additional booklets.

Comments on specific questions

Question 1

Most candidates were able to correctly identify double entry check as the correct answer.

Question 2

Most candidates were able to correctly identify MOD as the correct answer.

Question 3

(a) Most candidates indicated the correct description to the keyword. The one exception was for 'retrieves data from a file' where quite a few candidates indicated 'open' instead of 'read'.

(b) Most candidates stated one reason as to permanently store data, but most did not give a second reason.

Question 4

(a) Many candidates were able to identify the correct validation checks.

(b) Only a few candidates were able to achieve all the marks here. The answer required a loop and this was often missing and very few candidates correctly carried out a type check on the data. Many candidates did not use correct pseudocode especially when using the AND operator in the if statement. They missed the variable from the second part of the statement.

(c) Although most candidates identified the test data, some just indicated the type of test for the data such as normal which was incorrect.

Question 5

(a) Most candidates indicated two of the three errors with a few indicating the wrong Boolean operator.

(b) The flowchart was attempted well by most candidates. There were quite a few candidates who did not use the correct flowchart symbols and only put lines instead of arrows. Arrows also need to touch symbols or other arrows.

Question 6

Parts (a), **(b)** and **(c)** of this question were answered well by most candidates.

(d) This was answered well by most candidates. They correctly drew the correct logic gate symbols and in the correct order.

Question 7

Most candidates only achieved two of the marks as they described where the variables would be used. Very few candidates managed to achieve all four marks.

Question 8

(a) This question was answered well by most candidates. However, some candidates either had an incorrect calculation or used punctuation marks in the output field.

(b) Most candidates indicated that the decision box needs to be changed but then used incorrect pseudocode.

Question 9

(a) This was a well answered question.

(b) (i) Most candidates answered this question correctly.

(ii) Most candidates were able to recognise that the chosen field may not be unique.

(iii) This was a well answered question.

(c) Most candidates did not put punctuation in the output.

(d) This question was answered well. However, some candidates did not use AND in the WHERE field.

Question 10

Candidates were asked to meet three requirements. Requirement 1 was to find the maximum, minimum and average temperature reading for each day. Requirement 2 was to find the maximum, minimum and average temperature reading for the week and requirement 3 was to output the temperatures for each day and the week.

Requirement 1 was quite well attempted by most candidates who used a nested loops and the 2D array stated in the question. Quite a few candidates inputted the data for each day but this was not required as it was already stored. Quite a few did not extract the information correctly from the 2D array and failed to use both dimensions.

Requirements 2 was quite well attempted by many candidates.

Requirement 3 was met by only a few candidates as the output for the days needed to be inside the outer loop and the output for the week, outside of the loops.

Very few candidates achieved all aspects of each requirement.