

COMPUTER SCIENCE

Paper 2210/11 Paper 11 Theory
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Key messages

Candidates continue to demonstrate a good level of knowledge about the fundamental aspects of computer science. It would be beneficial for candidates to consider the context that is given in some questions. Candidates should look to reflect the application of this context in the knowledge and understanding they are required to demonstrate. This would allow candidates to demonstrate a greater level of understanding, beyond a general response, about the topic in question.

General comments

Candidates are reminded to make sure that they do not write outside the given writing space in a question. If additional writing space is required, candidates should use the additional pages available. They should make sure they clearly indicate the question for which they are providing a further response.

Comments on specific questions

Question 1

- (a) Most candidates were able to successfully convert the two denary values to binary.
- (b)(i) Many candidates were able to identify one similarity. Most candidates gave the response that they can be used to identify a device.
- (ii) Some candidates were able to provide two differences between the addresses. Some candidates only provided one side of the comparison. Candidates are reminded that if they are asked to provide a difference between two elements, they need to provide the information about the feature or characteristic of both. The most common answers given were about the how the address is assigned and that an internet protocol (IP) address can change, but a media access control (MAC) address normally does not.

Question 2

- (a) Many candidates were able to give three appropriate input devices. Some candidates gave three storage devices, rather than input devices. Candidates are reminded to read all the information provided in a question.
- (b) Few candidates were able to provide a fully correct answer. Many candidates provided the correct response for the bottom three rows. The most common errors were no tick for USB flash memory drive using NAND gates and all three being non-volatile. It would be beneficial for candidates to understand that USB flash memory drive and solid state drive (SSD) both operate using the solid-state memory method.
- (c)(i) Many candidates were able to provide two correct responses. The most common correct responses were 'cannot be inserted incorrectly' and 'supports different transmission speeds'. Some candidates repeated the benefit given in the question or something similar, for example universal connection, industry standard. It would be beneficial for candidates to have a wider understanding of the benefits of a universal serial bus (USB) connection. Common incorrect answer referred to the benefits of a USB flash memory drive, for example it is a portable device. It would be beneficial

for candidates to understand the difference between a USB connection and a USB device. It would also be beneficial for candidates to make sure that they have read the question in full.

- (ii) Most candidates gave the correct data transmission method.

Question 3

- (a) Many candidates were able to provide a full set of missing terms. The most common incorrect answer was 'It monitors traffic between the computer and the processor'.
- (b) Most candidates were able to provide three correct methods that could be used to keep the data safe. The most common incorrect answer was anti-spyware. It would be beneficial for candidates to apply the context given in a question, and in this case understand that anti-spyware will not directly keep stored data on a computer safe.

Question 4

Some candidates achieved the full marks available for this question. Many candidates demonstrated understanding that both methods encourage a user to provide personal details. Many candidates lacked accuracy in their answer, for example, understanding was provided that a legitimate looking email is sent in phishing, but then only referred to the email being opened and that taking the user to a fake website. It would be beneficial for candidates to understand that just opening the email is not enough to redirect the user to the fake website.

Question 5

Many candidates gave a very generic answer to this question and did not apply the context given. It would be beneficial for candidates to understand how to use the context given in a question and apply this to their answer. It would be beneficial for candidates to show a greater level of accuracy in answer questions about the application of sensors and microprocessors in a system. It would also be beneficial for candidates to understand that the sensor continuously send data to the microprocessor and that it does not just do this when it captures a certain value.

Question 6

- (a) Candidates continue to show a high level of ability in their understanding of logic circuits. The most common incorrect gate given was a NOR gate given in place of the XOR gate.
- (b) Many candidates were able to provide the rows that required correction.

Question 7

- (a) (i) Some candidates were able to achieve the full marks available for this question. Many candidates demonstrated understanding that a compression algorithm is used. Many candidates then provided an inaccurate understanding of the process. Most stated that data is not removed, but then stated that sounds not heard by the human ear would be removed. Many candidates also referred to repeating words being identified and indexed. It would be beneficial for candidates to have a greater understanding of how a lossless compression method is used to compress sound. It would also be beneficial for candidates to use the context given in the question and apply this to their answer.
- (ii) Some candidates identified that the company would look to do this to have the highest quality for the music. Many candidates lacked accuracy in their answer and stated that no data is lost. It would be beneficial to candidates to provide more detail than this about how that would be better for the music company.
- (iii) Many candidates were able to provide a correct response. The most common correct answer being that it allowed for quicker streaming of the data.
- (iv) Some candidates were able to provide a correct response. Many candidates reverted back to incorrectly stating that sounds not heard by the human ear would be removed. The most common correct answer was that it would be create a larger file size so will take more storage space. It

would be beneficial for candidates to have a greater understanding of the drawbacks of lossless compression in this context.

- (b) Some candidates demonstrated an accurate understanding of how web pages are requested and displayed. It would be beneficial for candidates to have an accurate understanding of the role of the web browser and the web server in this context.
- (c) Many candidates explained the operation of a denial of service (DoS) attack. This did mean they managed to achieve the marks in most cases, but it would be beneficial for candidates to answer the question given, instead of providing a generic response.

Question 8

- (a) Many candidates were able to provide the correct parity. Some candidates did not provide a correct response, instead adding a 1 or a 0 to the parity bit. This did not show understanding of the parity type that had been used.
- (b) Many candidates correctly identified that a transposition error could have occurred. Some candidates effectively gave this by example.
- (c) (i) Many candidates were able to correctly describe how data is sent using this method. It would be beneficial for candidates to show greater accuracy in their response, for example some stated that multiple bits are sent, but did not state this happens at the same time. Multiple bits are sent in both serial and parallel, the difference being they are not sent at the same time in serial.
 - (ii) Many candidates were able to give two correct drawbacks. The most common correct answers were that the bits may arrive skewed and that it does not work well over long distances.

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Paper 2210/12 Paper 12 Theory
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Key messages

Candidates continue to demonstrate a good level of knowledge about the fundamental aspects of computer science. It would be beneficial for candidates to consider the context that is given in some questions. Candidates should look to reflect the application of this context in the knowledge and understanding they are required to demonstrate. This would allow candidates to demonstrate a greater level of understanding, beyond a general response, about the topic in question.

General comments

Candidates are reminded to make sure that they do not write outside the given writing space in a question. If additional writing space is required, candidates should use the additional pages available. They should make sure they clearly indicate the question for which they are providing a further response.

Comments on specific questions

Question 1

- (a) Most candidates were able to provide the correct hexadecimal and binary values.
- (b) Most candidates were able to provide two benefits. It would be beneficial for candidates to be accurate with their response, some gave 'uses less space' but did not refer to where the space was saved. The most common incorrect answer was 'uses less storage space'. It would be beneficial for candidates to understand that hexadecimal will be stored as a binary value, so no storage space will be saved.
- (c) Many candidates were able to give three ways hexadecimal is used. Some candidates repeated the response given in the question. It would be beneficial for candidates to read the context of the question and not just provide a generic answer to the question.

Question 2

- (a) Few candidates were able to provide a fully correct answer. The most common correct answers were rows 1 and 4. The most common incorrect answers were rows 2 and 6. Many candidates ticked that pits and lands are used to store data for magnetic storage. It would be beneficial for candidates to have a greater understanding of the operation of magnetic and optical storage.
- (b)(i) Most candidates were able to give a correct example of storage. The most common incorrect answer was USB flash memory.
- (ii) Most candidates were able to give a correct example of storage. The most common incorrect answer was hard disk drive (HDD).
- (iii) Many candidates were able to give a suitable type of storage. Some candidates incorrectly gave optical storage. It would be beneficial for candidates to understand that optical storage is not suitable for this context and the reasons why. The most common justifications for magnetic is that it has a high capacity for data storage and that it has more longevity. The most common justifications for solid state were, it has faster read/write speeds and that it has a high storage capacity. Some candidates tried to justify that it has no moving parts so is portable. It would be beneficial for

candidates to apply the context of the question and recognise that a web server would not likely be a portable device and therefore not a suitable justification.

- (c) Very few candidates achieved marks for this question. It would be beneficial for candidates to read the question in full. Most candidates described the benefits of a USB connection or a USB drive. It would be beneficial for candidates to understand that USB flash memory is a type of solid-state storage and operates in the same way.

Question 3

- (a) Candidates continue to show a high level of ability in their understanding of logic circuits. The most common incorrect gate given was a XOR gate given in place of the NOR gate.
- (b) Many candidates were able to provide the rows that required correction.

Question 4

- (a) Some candidates were able to provide a fully correct answer. The most common incorrect response was candidates who ticked that denial of service (DoS) can be installed onto a web server. It would be beneficial for candidates to understand that a DoS attack prevents access to a webserver, but it is not installed onto one.
- (b) Most candidates were able to give three correct responses.
- (c) Many candidates were able to give three correct responses. The most common incorrect responses were further responses stating how data would be maliciously damaged. It would be beneficial for candidates to understand the difference between the ways that data could be maliciously damaged and accidentally damaged.

Question 5

- (a) Many candidates gave two correct sensors that could be used. The most common incorrect sensor given was pressure sensor, but this was not applicable to the context.
- (b) Many candidates gave a very generic answer to this question and did not apply the context given. It would be beneficial for candidates to understand how to use the context given in a question and apply this to their answer. It would be beneficial for candidates to show a greater level of accuracy in answer questions about the application of sensors and microprocessors in a system. It would also be beneficial for candidates to understand that the sensor continuously sends data to the microprocessor and that it does not just do this when it captures a certain value.

Question 6

- (a) Very few candidates showed understanding of how cookies can be used in this context. Many described a generic purpose of a cookie, and most repeated the question stating that the cookie would store the user's payment details. It would be beneficial for candidates to have a greater understanding of the use of cookies.
- (b) Some candidates were able to provide understanding of the issue that a person's computer could be hacked, and the information stored by the cookies could be obtained. Very few candidates were able to provide understanding beyond this. It would be beneficial for candidates to have a greater understanding of the concerns regarding the use of cookies.

Question 7

- (a) (i) Most candidates were able to give a suitable example of Hypertext Markup Language (HTML) structure.
- (ii) Most candidates were able to give suitable examples of HTML presentation.
- (b) Few candidates were able to provide reasons as to why the structure and presentation would be separated. Most gave a definition of what is meant by the structure and the presentation, and

repeated example of this. The most common correct response was that it means the style of the website can be easily edited.

Question 8

Many candidates were able to provide a fully correct set of missing terms. The most common incorrect answer was information map in place of character map.

COMPUTER SCIENCE

Paper 2210/21 Paper 21 Problem-Solving and Programming

Key messages

Candidates who had previously worked through the pre-release material (school council elections) and who completed the tasks by producing their own programming code were able to demonstrate appropriate techniques for solving this problem.

Candidates who took care to ensure they fully and specifically answered the question that was asked, scored higher marks than those who gave generic responses. Examples included: candidates who described how their program achieved certain tasks; candidates who supplied detailed annotations to their program code; candidates who took care to name or describe variables, constants and arrays appropriately to match their purpose, within the context or task required by the question.

Candidates are advised to answer algorithm questions as stated in the question, so that pseudocode questions are answered using pseudocode, program code questions are answered using program code and flowchart questions are answered using a flowchart.

Candidates are advised to make sure any answers they provide are appropriate for the command word used in the question, such that questions beginning with 'explain' will require more detail than those beginning with 'state', and usually require an explanation of how something was done, rather than a simple description of what was done.

General comments

Candidates demonstrated a good understanding of the requirements of the paper with very few questions left unanswered. The overall performance on this paper was of a good standard.

Candidates are reminded that they should avoid using punctuation marks and spaces in array, constant and variable names.

Comments on specific questions

Section A

Question 1

- (a) (i) Candidates who identified a relevant constant for **Task 1** and gave its value and use, usually achieved all or most of the marks for this question. Marks were lost if the answer was identifying a variable, or if it was not relevant to **Task 1**.
- (ii) Candidates who identified a variable and an array that could be used for **Task 1**, along with their use, achieved all or most of the marks for this question. Marks were lost if the response would not be appropriate as a variable or array, or it did not belong in **Task 1**.
- (b) Candidates who explained how they could change their program in **Task 1** so that the maximum number of permitted candidates in the election was eight, instead of four, achieved high marks in this question. Candidates were allowed to give a written explanation supported by suggestions of how their code could be changed. Those who did this, scored full or nearly full marks. Candidates who only wrote code did not gain any marks because an explanation was expected and required.

- (c) The vast majority of candidates achieved some marks for this question, which required a section of code to be written to solve part of **Task 2**. Candidates were allowed to write their response using pseudocode, program code or a flowchart. Candidates who wrote their response using program code generally performed better. The full range of marks was seen for this question, with most of the allowed marking points covered across the candidates, with the exception of validation of the unique voter number. This marking point was rarely seen.
- (d) This question required an explanation, and so, candidates who only wrote code did not achieve any marks. However, some very good responses were seen, with the best ones having written explanations as to how parts of **Task 3** were achieved, supported by examples of program code, for clarification. This demonstrated the candidate understood how they had achieved the task and that they were not simply re-writing the task from the scenario. The full range of marks was seen for this question, with many high scoring responses.

Section B

Question 2

Most candidates achieved at least one mark here, to demonstrate that they could identify facts related to validation or verification.

Question 3

Candidates were expected to name and describe relevant programming data types for some given examples of data. Some high scoring responses were seen, but the full range of marks was awarded across the whole cohort. Some candidates mixed up the two numeric data types: integer and real, for the examples of data in the question, while others mistakenly used database data types.

Question 4

- (a) Candidates were generally able to describe what the algorithm was doing, and so, achieve some or all of the marks. Answers were generally confined to the comparison and allocation of grades that was happening, along with the repeating of the algorithm for 30 candidates. Marks were alternatively available for noting that the marks was stored in `Score[Count]` and the grade was stored in `Grade[Count]`, but these marks were rarely given.
- (b) Some candidates achieved high marks for this question, and those who did, realised that only a short section of code was required to achieve the task stated in the question. Unfortunately, many candidates misunderstood the question and did not provide suitable code to simply output the contents of the arrays, preferably within a loop.
- (c) The vast majority of candidates understood how the given algorithm could be altered so that a teacher could use it with any size of class and gave suggestions worthy of credit. The full range of marks was seen, with some candidates therefore achieving all three marks.

Question 5

- (a) Some candidates found this trace table question to be a little challenging, however, many candidates did achieve three or four marks. Some marks were lost where candidates had not noticed that the algorithm stops when `-1` is entered, and incorrectly carried on with their trace table for the values that followed this value.
- (b) Many candidates were able to describe that the algorithm was outputting the type of test data that was being input i.e., extreme, abnormal or normal. Other candidates recognised that a range check was taking place. A small number of candidates correctly stated both of these points and achieved both marks.

Question 6

- (a) The vast majority of candidates were able to state that a primary key uniquely identifies each record.

- (b) The vast majority of candidates correctly identified the fact that the given database table contains 18 records. A small number of candidates erroneously stated the number of fields in the table.
- (c) The majority of candidates achieved at least one mark for the query-by-example grid, with many achieving three or four marks. Where candidates failed to gain the fourth mark, it was most likely because they had either missed off the search criteria, or they had made an error on this line.

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Paper 2210/22 Paper 22 Problem-Solving and Programming

Key messages

Candidates who had completed the tasks for the pre-release (train booking) were able to provide answers for **Section A** that showed good understanding of the tasks undertaken. Candidates, who read each question carefully and answered the question, as set on the paper, performed better than those who had memorised their solution and used all of that information without considering what information needed to be included in their answer.

Candidates should take care when declaring variables, constants and arrays to ensure that the identifier declared could be used in a program. Identifier names must not contain spaces. Once declared the same identifier name should be used throughout the answer.

Questions asking for an explanation about changes to a section of a program, for example **Question 1(d)**, require the candidate to explain what changes to program are required and include any programming code for those statements.

Trace tables should be clearly completed in ink, not in pencil with alterations made in ink, because both answers are visible when the answer is scanned.

General comments

Most candidates attempted all the questions on the paper.

Comments on specific questions

Section A

Question 1

- (a) Many candidates correctly identified an array used for **Task 1** and stated the data type and use. Common errors included obvious spaces in the name of the array and vaguely specified data types, for example number rather than integer.
- (b) Well answered by those candidates who described the specific validation checks required when inputting the number of tickets to buy for **Task 2**. Common errors included stating the name of a validation check without describing its use in context or describing a validation check for another input, for example choice of train.
- (c) Candidates that provided pseudocode or code for the part of **Task 2** specified in the question usually scored high marks. Those candidates drawing flowcharts often scored lower marks, as the flowcharts lacked the detail required. Many responses were far longer than required as some candidates incorrectly provided code for the whole of **Task 2**.
- (d) Those candidates that provided the programming statements used to complete **Task 3** together an explanation of each statement usually scored high marks. Unlike **part (c)**, this answer requires an explanation of how each of the candidate's programming statement works together with the programming statement used.

All programming statements included in an answer must be explained in order to be creditworthy. Several candidates did not attempt this part of the question.

Section B

Question 2

- (a) The full range of marks was seen for this question. Most candidates wrote pseudocode to find the largest and smallest numbers input. A common error was to initialise the variable to store the smallest number to a low value, for example `Small ← 0` instead of `Small ← 1000`.
- (b) Few candidates identified and described a suitable change to make testing less time consuming. Some candidates did not attempt this part of the question.

Question 3

- (a) Generally, well answered.
- (b) The full range of marks was seen for this question. A common error was to incorrectly state totalling instead of counting for `Number ← Number + 1`.

Question 4

- (a) Few candidates correctly completed all the columns in the trace table. Better candidates traced the algorithm carefully and realised that `PasswordRepeat` was only input if `Password` was 8 or more characters in length. Common errors included putting speech marks round the output or adding `END` to the output.
- (b) Many candidates found this part of the question challenging and scored few marks. Some candidates did not attempt this part of the question.

Question 5

Some candidates did not attempt this question.

- (a) Most candidates wrote a pseudocode routine that included a suitable loop structure. Setting all the elements of the given array to zero proved more challenging. Better candidates showed good understanding of the use of repetition with succinct and accurate pseudocode, for example
- ```
FOR Index ← 1 TO 20
 dataArray[Index] ← 0
NEXT Index
```
- (b) Many candidates found this part of the question challenging, some candidates gave well-reasoned explanations showing understanding of the use of a loop with a fixed number of iterations.

### Question 6

The full range of marks was seen for this question. Nearly all candidates could identify at least one error in the query-by-example grid. Common errors in the rewritten query-by-example grid included, enclosing the `FALSE` criteria in speech marks and not removing the incorrect criteria = "shade".