eduresourceza.com

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/11
Written Paper

Key messages

Candidates need to be aware that in order to achieve high marks in this qualification, they need to use the correct and appropriate technical terminology. Generalised and imprecise answers will not be given credit.

There were two questions where candidates were asked to write SQL statements. The best way to prepare candidates for questions on this topic is by through some practical work using simple databases which they can query by writing straightforward SQL scripts. Setting up the query using a QBE grid and then examining the SQL code automatically produced by the database software is not advisable. This code is unnecessarily complex for the level of answers that candidates would be expected to provide on this paper. There are a number of excellent online resources that could be used.

It is very important that the question stem is read carefully and the key words highlighted. Some of these key words will indicate the type of answer required, either a single statement or more extended prose, and others will indicate the context in which the question has been set. Identifying and understanding these key words will help candidates to give more appropriate answers to the questions on the examination paper. Several of the questions on this paper would have benefitted from careful reading. For example, Question 3 required answers in the context of hospital staff accessing a DBMS on a Local Area Network. Responses needed to be in this context.

General comments

Overall, there seemed to be a good understanding of the application of computers and the social effects of technology. The questions concerning the ethics of computing and the security of data were generally well answered. Questions on low level language processing and the internal operation of devices were found to be more challenging.

Candidates should be encouraged to write their answers clearly in the spaces provided on the examination paper. If there is a need to complete an answer elsewhere, it is important that candidates indicate where this answer now resides.

Comments on specific questions

Question 1

(a) (i) The majority of candidates were able to correctly convert the binary value to denary.

(ii) This question was generally not answered well. Candidates need to understand that in two's complement notation, a 1 in the most significant bit indicates a negative value. The most common incorrect answer was 136 (128 + 8).

(iii) The majority of candidates were able to correctly convert the denary value to binary.

(iv) The majority of candidates understood that the largest number that could be represented in eight bits was 0111 1111 or +127 in denary. Others need to understand that in two's complement, the smallest value that can be represented in eight bits is 1000 0000 which is –128. The most common incorrect answer was –127 and +127.

(b) (i) The majority of candidates able to correctly convert the denary value to BCD.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(ii) Candidates need to understand that it is not enough to say for example, '*the value is bigger than 9*'. There needs to be some identification of which value is bigger than 9 such as, '*the second nibble results in a value bigger than 9*'.

(iii) Many candidates were able to correctly describe an application for BCD. Others need to improve their understanding of this topic.

Question 2

(a) The majority of candidates were able to relate the last three context descriptions to the correct item of translation software. Some candidates need to improve their understanding of the translation process for client-side scripts.

(b) (i) A minority of candidates were able to describe what was meant by machine independence. Candidates should also be aware that answers that just re-word the question such as, '*machine independent means that Java is independent of the machine*' are far too vague and imprecise for credit at this level.

(ii) A minority of candidates provided good responses for this question. Candidates need to improve their understanding of the translation process for Java. There was also some confusion between the translation of JavaScript and the translation of Java.

Question 3

(a) The majority of candidates were able to name two suitable security measures.

(b) (i) Many candidates correctly started the calculation by multiplying each digit by its respective weighting, and continued with the division by 11 and the finding of the remainder. A minority then continued with the final step of the calculation and subtracted the remainder from 11 to obtain the check digit. Candidates also need to be aware that the check digit is the least significant digit in the final value. A common mistake was to add the check digit at the wrong end of the given value.

(ii) This part question was very well answered. Almost all candidates were able to name two suitable validation checks. This is a question where candidates must be aware of the need to answer in context. The question asked for validation checks on the primary key, so generic descriptions of the checks or checks on other values are not acceptable.

Question 4

(a) Many candidates correctly identified the various components. The most common error was the reversal of the control bus and the data bus.

(b) Many candidates found this question challenging. Candidates need to improve their understanding of relative addressing. Many candidates were able to continue the trace table for the next two rows i.e. the decrementing and storing of the value. Only a small number were able to successfully continue from there

(c) Many candidates found this question challenging. Candidates need to improve their understanding of how an assembler creates the symbol table. There was also considerable confusion about what was entered into the symbol table, even though the table had been completed in the question. Many candidates described the entry of instructions instead of the symbolic names; very few made any reference to the given table even though the question was quite specific.

(d) (i) This question was also not well answered. Candidates need to improve their understanding of the assembly process, and that the instructions are also translated into machine code from the mnemonic form, hence a table of binary equivalents for each assembly code instruction is also required.

(ii) Many candidates identified the correct binary value for A and proceeded to convert that value into correct Hexadecimal. A minority of candidates realised that B was the value of `CarryOn` from the previous table (104).

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

Question 5

(a) (i) Most candidates were able to name three components of a speaker, the most common incorrect answer was a microphone.

(ii) There were a small number of good answers to this question. Candidates need to improve their understanding of the internal operation of a speaker. Most candidates realised that a vibration was involved, but here too candidates need to be aware that vague answers such as '*a membrane vibrates*' without any other explanation are too imprecise for credit at this level.

(b) (i) There were many good answers to this question. This is a question where the context needed to be carefully considered. Candidates were told in the question that the user had a PC and needed a removable device for secondary storage, so answers must be devices that are suitable for this scenario. It is also a question where the terminology used must be carefully chosen. A number of candidates offered just '*USB*' as a device, with some even expanding the acronym to '*Universal Serial Bus*', which is clearly not a removable storage device. At this level of study this is imprecise.

(ii) The majority of candidates were able to describe two uses for their chosen device. Candidates need to be aware that answers such as '*saving music files*' and '*saving video files*' are both describing the same use i.e. '*saving files*', and so will not be given credit as two answers.

Question 6

(a) There were many good answers to this question. Candidates need to be aware of the differences between ethics in general and a company code of practice.

(b) Almost all candidates were able to describe two of the issues and identified the ACM/IEEE principle involved. Many candidates gave suitable possible actions.

Question 7

(a) (i) The majority of candidates correctly identified the primary keys for the first two tables. Identifying the primary key of the third table proved more challenging for many candidates who automatically took the two foreign keys to be a composite primary key, whereas in this example, this does not provide a unique identifier for each record.

(ii) Many candidates were able to correctly complete the E-R Diagram. There was some confusion with one to many relationships about which end of the relationship was the 'many' end.

(b) Most candidates were able to describe the changes needed. The most popular correct answer was to add an '`Attended`' attribute to the appointment table.

(c) (i) Many candidates read the table as far as the first entry for the `DoctorID` of 098 and then stopped, without looking further. These candidates gave only one site as the answer. Candidates should understand that in questions of this kind the complete table must be checked for the given data item.

(ii) The majority of candidates correctly added the site attribute to the appointment table.

(d) (i) A minority of candidates understood how to update data in a database using SQL. Candidates need to improve their understanding of the `UPDATE` command. Common errors were the omission of the attribute name in the `SET` and `WHERE` clauses and the omission of quotation marks around the values of the `DoctorID`.

(ii) Candidates generally found this question challenging. Candidates need to improve their understanding of referential integrity. A common error was to suggest that the update caused referential integrity rather than that the update violated referential integrity.

(e) This SQL question was well answered with a number of completely correct solutions. The most common error was the misspelling of attribute names in the `SELECT` and `WHERE` clauses.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/12
Written Paper

Key messages

Candidates should be aware of the need for the correct use of the appropriate technical terminology and for precision in answering questions to gain the highest marks on this qualification. At this level of study, generalised answers will not be given credit.

The best way to prepare candidates for questions on SQL is by exposing them to some practical work using simple databases which they can query by writing straightforward SQL scripts. Setting up the query using a QBE grid and then examining the SQL code automatically produced by the database software is not advisable, this code is unnecessarily complex for the level of answers that candidates would be expected to provide on this paper. If suitable software is not available there are a number of excellent online resources that could be used.

It is very important that the question stem is read carefully and the key words highlighted. Some of these key words will indicate the type of answer required, either a single statement or more extended prose, and others will indicate the context in which the question has been set. Identifying and understanding these key words will help candidates to give more appropriate answers to the questions on the examination paper. Several of the questions on this paper needed careful reading. For example, Question 3 required answers in the context of a school accessing a DBMS on a Local Area Network. Generalised responses or responses in a different context are unacceptable.

Careful reading of the question stem will also indicate to candidates answers that should be avoided, as for example in Question 1 where one of the possible answers is provided as an example in the stem of the question.

General comments

Overall, there seemed to be a good understanding of the application of computers and the social effects of technology. The questions concerning the ethics of computing and the security of data were generally well answered. Questions on low level language processing and the internal operation of devices were found to be more challenging.

Candidates should be encouraged to write their answers clearly in the spaces provided on the examination paper. If there is a need to complete an answer elsewhere, it is important that candidates indicate where this answer now resides.

Comments on specific questions

Question 1

The majority of candidates were able to correctly identify and describe three operating system management tasks. Candidates need to understand that if one of the tasks is stated in the question, for example, main memory management, simply repeating this as an answer will not gain any credit. Candidates also need to understand that it is not enough at this level to simply state ‘resource management’ without making it clear to which resource(s) the answer is referring to.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 2

(a) Most candidates were able to correctly identify the correct item of translation software for the first three context boxes. Many candidates need to understand that a web page containing some JavaScript code would be interpreted and not assembled or compiled.

(b) (i) Many candidates gave two correct benefits of a compiler. There was some confusion about speed. Candidates need to understand that it is not the actual process of compilation that is faster, rather the execution of the executable code produced as a product of the compilation process. At this level, it is not enough to simply give as a benefit that all the errors are reported at the end. This statement needs some further explanation, as it may not be seen as a benefit in all cases.

(ii) Similarly, many candidates gave two correct benefits of an interpreter. There was some confusion about errors. It is not enough to simply say that it is easier to locate errors. This statement needs some further explanation, as it may not always be true.

Question 3

(a) (i) Most candidates were able to distinguish between the security and privacy of data. Candidate need to take care with the wording of their answers to ensure that the differences are clear. Answers which re-iterate the term under discussion such as, '*the privacy of data means keeping the data private*' are not enough of a description to gain credit at this level.

(ii) The majority of candidates were able to give a suitable example. This is a question where the context needed to be carefully considered. Answers in an alternative context to that given in the question are unacceptable.

(b) The majority of candidates were able to correctly name and describe two security measures to protect data. Candidates need to understand that when the question says 'name and describe', it is insufficient to simply name the method. Further expansion is required in order to achieve all the marks.

(c) A minority of candidates answered this question well. Most candidates either confused verification with validation and so described validation checks such as range checks, length checks etc.; or gave answers that at this level were not detailed enough. It is not enough to say that verification ensures that the data is 'correct'. The data may be copied accurately but could still be incorrect.

Question 4

(a) Many candidates correctly identified the various components. The most common error was the reversal of the address bus and the control bus.

(b) There were some excellent answers to this question. Most candidates understood that increasing the clock speed would improve the performance of the PC, and many also included an explanation of the effects of over-clocking.

(c) (i) This question was not well answered. A minority of candidates could explain the meaning of the two terms. Candidates need to improve their understanding of the terminology and the differences between macros and directives.

(ii) This question was also not well answered. A minority of candidates were able to give a correct example of a directive. The most common error was to include one of the assembly language mnemonics given in the question paper.

(d) There were a few excellent answers to this question. Candidates need to improve their understanding of relative addressing. Many candidates were able to continue the trace table for the next two rows (the incrementing and storing of the value). Only a small number were able to successfully continue from there.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

(e) Many candidates found this question challenging. Candidates improve their understanding of how an assembler creates the symbol table. A significant number of candidates were able to successfully complete the relative address entry for `Value`, and the symbolic address entry for `EndProg`. The majority of candidates found it difficult to complete the rest of the table.

Question 5

(a) The majority of candidates were able to correctly identify whether the incidents represented ethical or unethical behaviour.

(b) The majority of candidates were able to correctly map each incident to the correct IEEE category.

Question 6

(a) Almost all candidates were able to correctly identify suitable input and output devices for the applications given.

(b) A minority of candidates understood the internal operation of a hard disk drive. Candidates need to improve their understanding of how a hard disk drive works. The most common error was the description of the operation of a CD or DVD drive rather than a hard disk drive. Candidates also need to be aware of the need to answer the question set on the examination paper. Many candidates offered generic descriptions about data being sent to the hard drive, which did not answer the question.

Question 7

(a) (i) The majority of candidates were able to correctly identify the primary keys of the first three tables. There was some confusion with the primary key of the third table. A common error was to identify `InterviewText` as the primary key.

(ii) Most candidates correctly identified the first relationship as one-to-many, and a significant number correctly identified the last relationship as many-to-one. The middle relationship was often incorrectly identified as one-to-one.

(b) Most candidates able to state that the `VisitReportText` attribute would need to be added to the `VISIT` table.

(c) (i) A minority of candidates understood how to update data in a database using SQL. Candidates need to improve their understanding of the `UPDATE` command. Common errors were the omission of the attribute name in the `SET` and `WHERE` clauses and the omission of quotation mark around the text values of the `ClientName`.

(ii) Many candidates found this question challenging. Candidates need to improve their understanding of referential integrity; a common error was to suggest that the update caused referential integrity rather than that the update violated referential integrity.

(d) This SQL question was well answered with a number of completely correct solutions. The most common errors were to use `Address` instead of `ClientName` in the `WHERE` clause, and the misspelling of attribute names in the `SELECT` and `WHERE` clauses. Candidates must use the exact attribute names given in the table definitions.

(e) Most candidates were able to state that either a suitable attribute indicating willingness to travel would need to be added to the staff table, or that an attribute identifying the country of operation would need to be added to the client table.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/13
Written Paper

Key messages

Candidates need to be aware that in order to achieve high marks in this qualification, they need to use the correct and appropriate technical terminology. Generalised and imprecise answers will not be given credit.

There were two questions where candidates were asked to write SQL statements. The best way to prepare candidates for questions on this topic is by through some practical work using simple databases which they can query by writing straightforward SQL scripts. Setting up the query using a QBE grid and then examining the SQL code automatically produced by the database software is not advisable. This code is unnecessarily complex for the level of answers that candidates would be expected to provide on this paper. There are a number of excellent online resources that could be used.

It is very important that the question stem is read carefully and the key words highlighted. Some of these key words will indicate the type of answer required, either a single statement or more extended prose, and others will indicate the context in which the question has been set. Identifying and understanding these key words will help candidates to give more appropriate answers to the questions on the examination paper. Several of the questions on this paper would have benefitted from careful reading. For example, Question 3 required answers in the context of hospital staff accessing a DBMS on a Local Area Network. Responses needed to be in this context.

General comments

Overall, there seemed to be a good understanding of the application of computers and the social effects of technology. The questions concerning the ethics of computing and the security of data were generally well answered. Questions on low level language processing and the internal operation of devices were found to be more challenging.

Candidates should be encouraged to write their answers clearly in the spaces provided on the examination paper. If there is a need to complete an answer elsewhere, it is important that candidates indicate where this answer now resides.

Comments on specific questions

Question 1

(a) (i) The majority of candidates were able to correctly convert the binary value to denary.

(ii) This question was generally not answered well. Candidates need to understand that in two's complement notation, a 1 in the most significant bit indicates a negative value. The most common incorrect answer was 136 (128 + 8).

(iii) The majority of candidates were able to correctly convert the denary value to binary.

(iv) The majority of candidates understood that the largest number that could be represented in eight bits was 0111 1111 or +127 in denary. Others need to understand that in two's complement, the smallest value that can be represented in eight bits is 1000 0000 which is –128. The most common incorrect answer was –127 and +127.

(b) (i) The majority of candidates able to correctly convert the denary value to BCD.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(ii) Candidates need to understand that it is not enough to say for example, '*the value is bigger than 9*'. There needs to be some identification of which value is bigger than 9 such as, '*the second nibble results in a value bigger than 9*'.

(iii) Many candidates were able to correctly describe an application for BCD. Others need to improve their understanding of this topic.

Question 2

(a) The majority of candidates were able to relate the last three context descriptions to the correct item of translation software. Some candidates need to improve their understanding of the translation process for client-side scripts.

(b) (i) A minority of candidates were able to describe what was meant by machine independence. Candidates should also be aware that answers that just re-word the question such as, '*machine independent means that Java is independent of the machine*' are far too vague and imprecise for credit at this level.

(ii) A minority of candidates provided good responses for this question. Candidates need to improve their understanding of the translation process for Java. There was also some confusion between the translation of JavaScript and the translation of Java.

Question 3

(a) The majority of candidates were able to name two suitable security measures.

(b) (i) Many candidates correctly started the calculation by multiplying each digit by its respective weighting, and continued with the division by 11 and the finding of the remainder. A minority then continued with the final step of the calculation and subtracted the remainder from 11 to obtain the check digit. Candidates also need to be aware that the check digit is the least significant digit in the final value. A common mistake was to add the check digit at the wrong end of the given value.

(ii) This part question was very well answered. Almost all candidates were able to name two suitable validation checks. This is a question where candidates must be aware of the need to answer in context. The question asked for validation checks on the primary key, so generic descriptions of the checks or checks on other values are not acceptable.

Question 4

(a) Many candidates correctly identified the various components. The most common error was the reversal of the control bus and the data bus.

(b) Many candidates found this question challenging. Candidates need to improve their understanding of relative addressing. Many candidates were able to continue the trace table for the next two rows i.e. the decrementing and storing of the value. Only a small number were able to successfully continue from there

(c) Many candidates found this question challenging. Candidates need to improve their understanding of how an assembler creates the symbol table. There was also considerable confusion about what was entered into the symbol table, even though the table had been completed in the question. Many candidates described the entry of instructions instead of the symbolic names; very few made any reference to the given table even though the question was quite specific.

(d) (i) This question was also not well answered. Candidates need to improve their understanding of the assembly process, and that the instructions are also translated into machine code from the mnemonic form, hence a table of binary equivalents for each assembly code instruction is also required.

(ii) Many candidates identified the correct binary value for A and proceeded to convert that value into correct Hexadecimal. A minority of candidates realised that B was the value of `CarryOn` from the previous table (104).

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

Question 5

(a) (i) Most candidates were able to name three components of a speaker, the most common incorrect answer was a microphone.

(ii) There were a small number of good answers to this question. Candidates need to improve their understanding of the internal operation of a speaker. Most candidates realised that a vibration was involved, but here too candidates need to be aware that vague answers such as '*a membrane vibrates*' without any other explanation are too imprecise for credit at this level.

(b) (i) There were many good answers to this question. This is a question where the context needed to be carefully considered. Candidates were told in the question that the user had a PC and needed a removable device for secondary storage, so answers must be devices that are suitable for this scenario. It is also a question where the terminology used must be carefully chosen. A number of candidates offered just '*USB*' as a device, with some even expanding the acronym to '*Universal Serial Bus*', which is clearly not a removable storage device. At this level of study this is imprecise.

(ii) The majority of candidates were able to describe two uses for their chosen device. Candidates need to be aware that answers such as '*saving music files*' and '*saving video files*' are both describing the same use i.e. '*saving files*', and so will not be given credit as two answers.

Question 6

(a) There were many good answers to this question. Candidates need to be aware of the differences between ethics in general and a company code of practice.

(b) Almost all candidates were able to describe two of the issues and identified the ACM/IEEE principle involved. Many candidates gave suitable possible actions.

Question 7

(a) (i) The majority of candidates correctly identified the primary keys for the first two tables. Identifying the primary key of the third table proved more challenging for many candidates who automatically took the two foreign keys to be a composite primary key, whereas in this example, this does not provide a unique identifier for each record.

(ii) Many candidates were able to correctly complete the E-R Diagram. There was some confusion with one to many relationships about which end of the relationship was the 'many' end.

(b) Most candidates were able to describe the changes needed. The most popular correct answer was to add an '`Attended`' attribute to the appointment table.

(c) (i) Many candidates read the table as far as the first entry for the `DoctorID` of 098 and then stopped, without looking further. These candidates gave only one site as the answer. Candidates should understand that in questions of this kind the complete table must be checked for the given data item.

(ii) The majority of candidates correctly added the site attribute to the appointment table.

(d) (i) A minority of candidates understood how to update data in a database using SQL. Candidates need to improve their understanding of the `UPDATE` command. Common errors were the omission of the attribute name in the `SET` and `WHERE` clauses and the omission of quotation marks around the values of the `DoctorID`.

(ii) Candidates generally found this question challenging. Candidates need to improve their understanding of referential integrity. A common error was to suggest that the update caused referential integrity rather than that the update violated referential integrity.

(e) This SQL question was well answered with a number of completely correct solutions. The most common error was the misspelling of attribute names in the `SELECT` and `WHERE` clauses.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/21
Written Paper

Key messages

The emphasis for this paper is on the application of practical skills. Candidates need to have developed these and be able to apply them to the scenarios presented if they are to achieve high marks.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly.

It is important that candidates use the correct syntax when writing or explaining algorithms using pseudocode or program code. Differentiating between an identifier name and a string by enclosing the latter within quotation marks is particularly important.

Candidates need to read each question carefully before attempting to answer it.

General comments

There were some excellent answers to the programming questions, but a significant number of candidates showed programming skills that suggests they had little programming practise. Candidates need extensive practical programming experience before they sit this examination.

As in previous sessions, no marks were awarded for programming answers that did not use one of these three languages.

Python solutions were often the cleanest, but there were also a number of excellent Visual Basic responses. There were not many responses in Pascal.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is key to defining the program structure.

If answers have been crossed out, the new answers must be written very clearly so that the text can be read easily and candidates can be rewarded with the correct mark.

Many candidates make use of blank pages for rough work when preparing their final answer. In these cases, it is extremely helpful if this text is crossed out.

Comments on specific questions

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Question 1

(a) (i) The majority of candidates showed a good understanding of data types. An occasional mistake was to identify the values ‘27’ and ‘27.3’ as integer and real data types respectively.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

(ii) Many candidates correctly identified an array. A small number fully described it by including a reference to the number of dimensions. Some candidates seemed confused by the concept of a data structure and simply stated a data type (e.g. INTEGER). Others referred to the use of a spreadsheet or database.

(iii) Although many candidates appreciated that characters were represented by a value of some kind, it was rare to see a precise answer stating that each character was represented by a unique value. Some candidates referred to 'changing a string into a number'.

(b) Most candidates gained one mark by stating a single reason.

(c) Some candidates achieved all four marks. Most of the candidates gained at least one mark for giving the output message. Many responses included `IF` components within the `CASE` structure.

(d) Most candidates gained full marks. Incorrect answers included stating that the code would be 'written in a way that is like English' or simply referring to a 'syntax error'.

Question 2

(a) There were varied responses to this question, with candidates gaining either 0 or 3 marks.
A significant number of candidates gave correct answers for the `Number` and `Remainder` columns but then did not state the correct output.

(b) This question was answered well by a minority of the candidates. Many candidates correctly described the algorithm. Others incorrectly stated that the algorithm was used to look for even numbers. Many did not mention that the values and number of values found were output.
Many candidates did not seem to understand the directive to 'Describe the purpose of the algorithm'. They simply explained each line of pseudocode.
A small number attempted to explain in general terms the meaning of the word 'algorithm'.

(c) There were many high mark answers. Marks were commonly awarded for flowchart symbols that contained input/output, assignment or conditional statements.
Iteration was often not well addressed, with many candidates simply writing the line of pseudocode "`FOR Number ← StartNumber TO EndNumber`" inside a rectangular symbol and omitted any separate reference to incrementing `Number`.
Many candidates did not understand the logic as the algorithm was ended as soon as the first remainder of zero was encountered. Marks were often lost at the point where the loop repeats. This was either missed out, returned to the wrong place, or came out from the wrong statement.
Many candidates outputted `Number` every time the condition '`is remainder = 0?`' was tested, regardless of the outcome.
Another mistake often seen was the use of a conditional symbol with only a single output.
Symbol shapes were generally not well used, although most candidates did make use of the diamond symbol for a conditional test. Some leniency was applied when marking, as many candidates used the rectangular symbol by default. Candidates are expected to use the correct symbols for the any type of operation.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 3

(a) A minority of candidates were able to provide a fully correct solution.
Many candidates did not gain the mark for declaring an integer loop-count variable or a temporary string variable to be used when swapping elements.
Many candidates correctly recognised the requirement to use some form of loop and occasionally nested loops were seen. Frequently the ranges were incorrect and subsequent code would have resulted in an invalid array index being used. Several candidates did not use the fact that the array was defined as having 100 elements and attempted to reference the length of the array using a statement such as "`FOR Count ← 1 TO UserNameArray`". Solutions that did include a nested loop often mixed the index variables when performing the swap.
Candidates often gave the correct lines of code to swap adjacent values. This often appeared out of context.
Many candidates recognised that they had to extract the first six characters to make the comparison.

(b) Candidates often included an unnecessary complication of a nested loop.
The element comparison was often incorrect. In a number of instances, candidates compared two elements using < or > rather than =. Many candidates did gain the mark for incrementing a repeat count following a comparison.
A common misunderstanding was to setup a loop from 1 to 100 and then to reference element 101.
Candidates often output the first element (rather than the duplicate). Many used output statements that did not match the example given in the question.

(c) (i) A minority of candidates were able to answer this question. Some candidates gained marks for 'Design, Code, Test' style answers.
It was common to see answers that gave any three programming-related terms. 'Input, Process, Output' were frequently given.

(ii) A significant number of candidates did not attempt this question. Many candidates correctly identified the meaning of the term IDE. Many of the other candidates correctly described one of the supported functions.

(iii) This question was generally answered well. A wide range of correct answers were seen. A number of candidates offered vague answers which were insufficient, for example 'syntax error' in place of 'dynamic syntax checking'.

(iv) Only a small number of candidates identified the correct error. Many candidates attempted to explain the error rather than to state the type as the question asked. 'Syntax' and 'Logic' were frequent answers.

Question 4

(a) Many candidates provided a correct answer for the first part. A common error for the second part was to assume that the value would be rounded up to 7.46.

(b) A minority of candidates provided perfect answers for this part. Candidates often omitted the '$' and '£' signs. Many put '#' instead of a '0'.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 5

(a) A minority of candidates answered this question well. Lack of quotation marks around file names (to differentiate a string value from an identifier name) was almost universal, and file open modes were often missing or incorrect.
Many candidates attempted to close a file without specifying the file concerned.
Some candidates offered statements such as 'add the line to the new file' which may possibly be acceptable as an example of structured English but does not qualify as pseudocode.
A number of candidates gave an answer in a specific programming language, rather than in pseudocode as the question specified.

(b) Many candidates achieved full marks for this question and correctly addressed the requirement to test each rule separately.
Some candidates explained that the email address was invalid, based on restrictions that they believed would be applied by an individual ISP. The rules given in this style of question are the only ones that are relevant, unless the question clearly states otherwise.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/22
Written Paper

Key messages

The emphasis for this paper is on the application of practical skills. Candidates need to have developed these and be able to apply them to the scenarios presented if they are to achieve high marks.

There were some excellent answers to the programming questions, but a significant number of candidates displayed low programming ability. Candidates need extensive practical programming experience before they sit this examination.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly.

It is important that candidates use the correct syntax when writing or explaining algorithms using pseudocode or program code. Differentiating between an identifier name and a string by enclosing the latter within quotation marks is particularly important.

Candidates need to read each question carefully before attempting to answer it.

General comments

Visual Basic (console mode) and Python were equally popular, with only a very small minority using Pascal. As in previous sessions, no marks were awarded for programming answers that did not use one of these three languages.

Python solutions were often the cleanest, but there were also a number of excellent Visual Basic responses.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is key to defining the program structure.

If answers have been crossed out, the new answers must be written very clearly so that the text can be read easily and candidates can be rewarded with the correct mark.

Many candidates make use of blank pages for rough work when preparing their final answer. In these cases, it is extremely helpful if this text is crossed out.

Comments on specific questions

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Question 1

(a) (i) This was well answered by the majority of candidates, indicating a good understanding of data types. A fairly common mistake was to identify the value '35' as an integer data type.

(ii) Many candidates correctly recognised the data structure of an array, but relatively few fully described it as a one-dimensional array.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

(iii) Many candidates used selection, iteration, data declarations and assignments in their answers as required. Others merely referred to the general concept of programming, rather than code features.

(b) (i) Many candidates were able to provide either the binary or decimal values. Others either did not attempt the question or just added the letters of 'CAGE' into the table.

(ii) Many candidates referred to the use of ASCII codes and the fact that space characters would be being included in the string. A common mistake was to attempt to explain how the `LENGTH()` function would count the characters, often including an example. Other incorrect answer was to refer to the function as needing to return a value of type `INTEGER`.
Correct answers were almost exclusively based on the mechanism of storing a count value together with the string. Many answers did not include any mention of the use of a special termination character.

(c) The majority of candidates misunderstood this question and gave a description of `ByVal` and `ByRef` mechanisms. A small number of candidates correctly stated that parameters were involved in passing values to and from subroutines. References to any of the other mark points were not seen.

(d) (i) The majority of candidates were successful in answering this question. Many candidates simply wrote 'Fail' or 'invalid value entered' which was insufficient as the question asks to 'Explain...'
A significant number of candidates stated that the first value would result in the output of the string 'Fail' rather that the assignment of this string value to a variable. This indicates a misunderstanding of fundamental programming concepts.

(ii) This was generally well answered, with most candidates gaining at least 3 marks.
A significant number of candidates still offered '`MyGrade >=75 AND <=100`' as a conditional test.
The use of `IF ... THEN ... ELSE .. ENDIF` structure often appeared vague. Candidates often omitted '`THEN`'.
Several candidates made the mistake of offering the solution as separate `IF` statements (not linked using `ELSE`) without appreciating that these would be processed independently. The consequence of this was to assign either '`Distinction`' or '`Pass`' to `My Grade` and also outputting the '`Invalid value entered`' message.

Question 2

(a) There were many good responses to this question. Many candidates only gained 1 of the 2 marks due to not fully answering the question. These answers mentioned searching the array `ClassName` for a given value, `SearchValue`, but did not mention anything about the outputs.
This was another question where some of the language used was vague. For example, 'looking up' cannot be considered as equivalent of 'searching for'.
Many candidates did not read the question properly and explained each line of pseudocode instead of 'describing the purpose of the algorithm'.
A small number attempted to explain in general terms the meaning of the word 'algorithm'.

(b) Many candidates scored high marks for this question. Marks were commonly awarded for flowchart symbols containing input/output, assignment or conditional statements. For Iteration, many candidates wrote the line of pseudocode '`WHILE Index < 101 AND FoundFlag = FALSE`' inside a rectangular symbol and omitted any separate reference to incrementing `Index`.
Many candidates did not seem to understand the logic and often ended the algorithm as soon as the flag was false. Another mistake often seen was the use of a conditional symbol with only a single output.
Symbol shapes were generally not well used, although most candidates did make use of the diamond symbol for a conditional test. Some leniency was applied when marking, as many candidates used the rectangular symbol by default. Candidates must use the correct symbols on a flowchart.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

Question 3

A minority of candidates were able to achieve all the marks for this question. The majority only gained one or two marks.
The line transposition error (`ENDIF` and `ENDFOR` reversed) was correctly identified by most candidates, as was the need to change the 6 to 4 in order to obtain the `ProductID`.
Many candidates were unable to identify the use of '`TONUM`' instead of '`MODULUS`'.
A minority of candidates were able to correct the loop range errors. Candidates generally did not seem to be familiar with the mechanics of a bubble sort algorithm.

Question 4

(a) Many candidates made little or no attempt at this question. The quality of responses suggests that candidates are still not experiencing enough actual problem solving and practical programming experience prior to this examination. Many answers offered pseudocode rather than a required programming language code.
Although a high-mark question, the task itself was not complex. Candidates were expected to declare variables and output the fixed text shown in the question. Candidates who did offer some form of output often did not use the format given. Many candidates did not output the expected frequency and the column headings, which required simple code.
Many responses included the use of an input statement to obtain the number of repetitions despite the question clearly defining this as a parameter.
Array declarations were uncommon and only a very few candidates included code to initialise the array elements to 0.
Most candidates included a loop to generate the random numbers and often this included correct us of the relevant language function. In many cases the loop was repeated 10 times instead of the number specified by `Repetitions`.
Many candidates completely omitted the output of the results.

(b) Single-stepping was the most popular correct answer and was generally well-described. Answers with explaining Breakpoints often lacked real understanding. In many cases, candidates referred to the code stopping when it hit an error. References to a variable watch window were the least frequent.
Many candidates simply offered any three features of an IDE instead of a feature for debugging.

(c) Only a small number of candidates correctly read the question and referred to checks that could be made when looking at the output from the program. The majority of candidates simply produced standard text-book answers, usually describing black-box and white-box testing.

Question 5

The responses from the majority of candidates suggest that the fundamentals of pseudocode are not well understood.
Most candidates achieve only the mark for the input of the membership number.
The question asks for a procedure to be written, but many candidates omitted the procedure declaration and end statement.
A lack of quotation marks around file names (to differentiate a string value from an identifier name) was almost universal, and incorrect constructs such as `INPUT ← MembershipNumber` were commonly seen.
Many candidates attempted to close a file without specifying the file concerned. File open modes were often missing or incorrect.
Many candidates used responses such as 'copy the file except the deleted member', which may possibly be acceptable as an example of structured English, but does not qualify as pseudocode.
A number of candidates gave an answer in a specific programming language, rather than in pseudocode as the question specified.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/23
Written Paper

Key messages

The emphasis for this paper is on the application of practical skills. Candidates need to have developed these and be able to apply them to the scenarios presented if they are to achieve high marks.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly.

It is important that candidates use the correct syntax when writing or explaining algorithms using pseudocode or program code. Differentiating between an identifier name and a string by enclosing the latter within quotation marks is particularly important.

Candidates need to read each question carefully before attempting to answer it.

General comments

There were some excellent answers to the programming questions, but a significant number of candidates showed programming skills that suggests they had little programming practise. Candidates need extensive practical programming experience before they sit this examination.

As in previous sessions, no marks were awarded for programming answers that did not use one of these three languages.

Python solutions were often the cleanest, but there were also a number of excellent Visual Basic responses. There were not many responses in Pascal.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is key to defining the program structure.

If answers have been crossed out, the new answers must be written very clearly so that the text can be read easily and candidates can be rewarded with the correct mark.

Many candidates make use of blank pages for rough work when preparing their final answer. In these cases, it is extremely helpful if this text is crossed out.

Comments on specific questions

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Question 1

(a) (i) The majority of candidates showed a good understanding of data types. An occasional mistake was to identify the values ‘27’ and ‘27.3’ as integer and real data types respectively.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

(ii) Many candidates correctly identified an array. A small number fully described it by including a reference to the number of dimensions. Some candidates seemed confused by the concept of a data structure and simply stated a data type (e.g. INTEGER). Others referred to the use of a spreadsheet or database.

(iii) Although many candidates appreciated that characters were represented by a value of some kind, it was rare to see a precise answer stating that each character was represented by a unique value. Some candidates referred to 'changing a string into a number'.

(b) Most candidates gained one mark by stating a single reason.

(c) Some candidates achieved all four marks. Most of the candidates gained at least one mark for giving the output message. Many responses included `IF` components within the `CASE` structure.

(d) Most candidates gained full marks. Incorrect answers included stating that the code would be 'written in a way that is like English' or simply referring to a 'syntax error'.

Question 2

(a) There were varied responses to this question, with candidates gaining either 0 or 3 marks.
A significant number of candidates gave correct answers for the `Number` and `Remainder` columns but then did not state the correct output.

(b) This question was answered well by a minority of the candidates. Many candidates correctly described the algorithm. Others incorrectly stated that the algorithm was used to look for even numbers. Many did not mention that the values and number of values found were output.
Many candidates did not seem to understand the directive to 'Describe the purpose of the algorithm'. They simply explained each line of pseudocode.
A small number attempted to explain in general terms the meaning of the word 'algorithm'.

(c) There were many high mark answers. Marks were commonly awarded for flowchart symbols that contained input/output, assignment or conditional statements.
Iteration was often not well addressed, with many candidates simply writing the line of pseudocode "`FOR Number ← StartNumber TO EndNumber`" inside a rectangular symbol and omitted any separate reference to incrementing `Number`.
Many candidates did not understand the logic as the algorithm was ended as soon as the first remainder of zero was encountered. Marks were often lost at the point where the loop repeats. This was either missed out, returned to the wrong place, or came out from the wrong statement.
Many candidates outputted `Number` every time the condition '`is remainder = 0?`' was tested, regardless of the outcome.
Another mistake often seen was the use of a conditional symbol with only a single output.
Symbol shapes were generally not well used, although most candidates did make use of the diamond symbol for a conditional test. Some leniency was applied when marking, as many candidates used the rectangular symbol by default. Candidates are expected to use the correct symbols for the any type of operation.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 3

(a) A minority of candidates were able to provide a fully correct solution.
Many candidates did not gain the mark for declaring an integer loop-count variable or a temporary string variable to be used when swapping elements.
Many candidates correctly recognised the requirement to use some form of loop and occasionally nested loops were seen. Frequently the ranges were incorrect and subsequent code would have resulted in an invalid array index being used. Several candidates did not use the fact that the array was defined as having 100 elements and attempted to reference the length of the array using a statement such as "`FOR Count ← 1 TO UserNameArray`". Solutions that did include a nested loop often mixed the index variables when performing the swap.
Candidates often gave the correct lines of code to swap adjacent values. This often appeared out of context.
Many candidates recognised that they had to extract the first six characters to make the comparison.

(b) Candidates often included an unnecessary complication of a nested loop.
The element comparison was often incorrect. In a number of instances, candidates compared two elements using < or > rather than =. Many candidates did gain the mark for incrementing a repeat count following a comparison.
A common misunderstanding was to setup a loop from 1 to 100 and then to reference element 101.
Candidates often output the first element (rather than the duplicate). Many used output statements that did not match the example given in the question.

(c) (i) A minority of candidates were able to answer this question. Some candidates gained marks for 'Design, Code, Test' style answers.
It was common to see answers that gave any three programming-related terms. 'Input, Process, Output' were frequently given.

(ii) A significant number of candidates did not attempt this question. Many candidates correctly identified the meaning of the term IDE. Many of the other candidates correctly described one of the supported functions.

(iii) This question was generally answered well. A wide range of correct answers were seen. A number of candidates offered vague answers which were insufficient, for example 'syntax error' in place of 'dynamic syntax checking'.

(iv) Only a small number of candidates identified the correct error. Many candidates attempted to explain the error rather than to state the type as the question asked. 'Syntax' and 'Logic' were frequent answers.

Question 4

(a) Many candidates provided a correct answer for the first part. A common error for the second part was to assume that the value would be rounded up to 7.46.

(b) A minority of candidates provided perfect answers for this part. Candidates often omitted the '$' and '£' signs. Many put '#' instead of a '0'.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 5

(a) A minority of candidates answered this question well. Lack of quotation marks around file names (to differentiate a string value from an identifier name) was almost universal, and file open modes were often missing or incorrect.
Many candidates attempted to close a file without specifying the file concerned.
Some candidates offered statements such as 'add the line to the new file' which may possibly be acceptable as an example of structured English but does not qualify as pseudocode.
A number of candidates gave an answer in a specific programming language, rather than in pseudocode as the question specified.

(b) Many candidates achieved full marks for this question and correctly addressed the requirement to test each rule separately.
Some candidates explained that the email address was invalid, based on restrictions that they believed would be applied by an individual ISP. The rules given in this style of question are the only ones that are relevant, unless the question clearly states otherwise.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/31
Written Paper

Key messages

In order to be successful on this advanced theory paper, candidates need to show an in-depth study of the topics and make good use of appropriate technical terminology. Candidates, who have studied the theory and have also practised the precise use of these tools and techniques, were able to demonstrate successfully how they could be used to solve the problem set on the examination paper.

Candidates need to show good examination technique by answering the question as set on the examination paper in the space provided for the answer or clearly indicating where the answer is to be found on the examination paper.

General comments

There was some evidence in this examination that many candidates had not read questions carefully before attempting to write an answer. For example in Question 1(c)(ii), the instruction is 'Explain why….' and in Question 1(c)(iii), the instruction is 'Explain how….'. These instructions require different types of answer; reasons why for Question 1(c)(ii) and an explanation of how the task would be completed for Question 1(c)(iii).

Candidates answering questions where some information is provided as part of the question need to take care that they do not repeat this information as part of the answer. For example, in Question 4(b) the first three steps of the handshake protocol are given in the question and cannot be used as part of an answer.

Comments on specific questions

Question 1

(a) Many candidates correctly completed the diagram for a star topology. Many had drawn lines to the server rather than the switch.

(b) This part of the question was well answered with many responses correctly identifying whether all each of the four statements was true or false. The second statement in the list was incorrectly identified most often.

(c) (i) Most candidates correctly identified the device as the switch or the server. Many of these candidates were not able to provide a good reason. An example of a suitable reason provided for the switch is 'the switch is directly connected to all the computers'.

(ii) Many candidates found this part of the question challenging. Candidates needed to explain why the router was required. For example, 'to forward packets between the LAN and the internet'.

(iii) Many responses included some explanation of how the packets are transmitted from the router to the web server. Few responses included sufficient detail to gain all three marks available.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 2

(a) Most candidates could correctly match a description to at least one appropriate type of computer architecture. Better responses correctly matched at least three of the four descriptions to the appropriate computer architecture.

(b) Many responses correctly identified that there was only one separate processor.

(c) Many candidates found this part of the question challenging. A small number of candidates gave sufficiently detailed answers. An example of an answer that would gain both marks is 'split the program into blocks of code that can be processed simultaneously by different processors'.

(d) Many candidates found this part of the question challenging. An example of an answer that would gain both marks is 'communication between processors is a hardware problem as each processor needs a link to every other processor'.

Question 3

(a) (i) This question was generally answered well.

(ii) This question was generally answered well.

(iii) This question was generally answered well.

(b) Responses that showed confidence in the use of Backus-Naur Form (BNF) notation were generally correct. Many other responses did not show the correct use of the notation. Common errors seen included the incorrect use of '::=' instead of ':= ' for assignment and the incorrect inclusion of '< >' around terminal symbols.

(c) Responses that showed confidence in the use of syntax diagrams were generally correct. Other responses did not show the diagram drawn correctly. Common errors included the incorrect use of backtracking and not including the case without digit in the syntax diagram for a variable.

(d) Many candidates found this part of the question challenging. Few candidates gained full marks. A common error was to incorrectly put '< >' around the decimal point in the BNF notation for a real.

Question 4

(a) (i) This question was generally answered well.

(ii) The majority of candidates correctly identified that the purpose of Transport Layer Security(TLS) is to provide secure communication over a network. Further explanation proved challenging for many candidates. Better responses included the two-layer composition of the protocol, and the use of encryption.

(b) Responses that showed understanding of how public and private keys are used during the handshake process gained good marks for this question. At this level, candidates need to be able to provide a clear outline of the use of these keys to establish a session key. An outline was clearly requested in the question and illustrated by the provision of the first three steps in the process, so the candidates were shown what was required. Credit could not be given for the inclusion of these steps in a response.

(c) There was a full range of marks for this question. Common correct answers included on-line banking and on-line shopping.

Question 5

(a) (i) The majority of responses showed a correctly completed truth table.

(ii) This question was generally answered well. A common incorrect response was to repeat the pattern for a two input NAND gate with zero output for a 0 0 1 input.

(b) (i) There was a full range of marks for this question with no real pattern.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(ii) The explanation of the problem shown in the final row of the table in part (b)(i) proved challenging for some candidates. Responses needed to contain detailed explanation in order to achieve high marks. For example, 'the flip-flop becomes unstable as Q and $\overline{Q}$ should be complements of each other'.

(c) (i) There was a full range of marks for this question.

(ii) The explanation for why the JK flip-flop is an improvement on the SR flip-flop proved challenging for some candidates. Responses needed to provide a detailed explanation in order to achieve high marks. For example, 'SR flip-flop inputs may arrive at different times, whereas a JK flip-flop incorporates a clock pulse for synchronisation'.

(d) Many responses showed understanding that flip-flops can be used as storage. In order to achieve high marks, responses needed to be more detailed. For example, 'a single flip-flop can be used to store one bit'.

Question 6

(a) (i) This question was generally answered well.

(ii) This question was generally answered well.

(b) Many responses correctly identified two other devices. Providing a justification that clearly related to the control system described in the question proved more challenging for most candidates.

(c) (i) Responses that showed confidence in the dry running of assembly language code were generally correct. Many other responses showed little understanding of this technique and gained few or no marks.

(ii) Responses needed to show an understanding of the use of the register, `LOWREG`, to indicate a sensor reading below the minimum temperature. This did not seem to be fully understood. Many incorrectly stated that 32 was the minimum temperature allowed.

(iii) Responses needed to show an understanding of what the assembly language code would have to do to turn on the heaters in those areas that are below the minimum temperature. This did not seem to be fully understood.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/32
Written Paper

Key messages

Candidates need to develop their skills in answering questions that require detailed explanation, description or justification of a solution.

General comments

In general, candidates showed a good understanding of most areas of the syllabus. In many instances, the answers were generic and lacked sufficient technical detail. Many candidates were familiar with concepts such as Backus-Naur Form but often did not produce the correct syntax.
There were areas where candidates need to improve their knowledge and understanding such as pipelining, software development environment running on a virtual machine, BNF syntax diagrams and SR and JK flip-flops.

Comments on specific questions

Question 1

(a) Candidates who actually drew a bus often connected the router to the server instead of connecting it to the bus. Other mainly correct drawings often had the terminators missing. A number of candidates appeared to believe that the router could act as a terminator, and many drawings stopped the bus at the (given) connection between the router and the Internet.

(b) Most candidates answered this question well.

(c) (i) Most candidates were able to answer this question, although many did not score full marks.

(ii) Many candidates had made a good attempt to answer this question. Candidates needed to indicate a random time before re-transmission of data instead of 'waiting for some time'.

(d) (i) Many correct responses for star topology, and many candidates understood that this meant each device would have a dedicated connection pathway. Candidates seemed to want to include a switch at the centre or connect everything to the router, rather than the server.
Many candidates described changes to the hardware rather than the topology.

(ii) Many candidates gained the first mark for the dedicated line. Candidates needed to elaborate and explain how this helps to overcome the problem.

Question 2

(a) Many candidates made a good attempt in answering this question. Most candidates were only able to score up to two marks out of the possible four. Candidates' knowledge in this area will need to improve.

(b) (i) Many candidates used the phrase ‘instruction level parallelism’ to gain marks. Others struggled to explain this concept.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

(ii) Candidates need to have a better understanding of pipelining. Few candidates scored full marks. Some candidates only put in the first D, whilst others omitted this but then managed to complete the rest. A significant number of candidates put D and E the wrong way round.

(c) (i) A number of candidates correctly identified the issue; however, their explanations needed to be better developed. Many candidates realised that the problem was somehow connected to the use of register r3 in the first two instructions.

(ii) There were few correct answers to this question. The most common response was to suggest using a different register for r3 in the first instruction. Few candidates suggested the interchange of the instructions.

Question 3

(a) (i) There were few correct answers to this question. Many had stated the correct names the wrong way round.
Candidates need to increase their practical experience in the use of a virtual machine and answers generally reflected their lack of experience.

(ii) Many candidates copied the wording from the diagram. Many candidates confused 'data' with 'data request'. Candidates wrote about the data being passed from the guest OS to the Virtual Machine instead of the data request.
Candidates were expected to do more than repeat the sequence which was shown by the diagram. Many candidates incorrectly believed that the question was about virtual memory.

(b) (i) The most common correct answer was that the software could be tried on different OS without the need to purchase additional hardware. There were many vague answers which mentioned better, cheaper, quicker etc.

(ii) More detailed explanation was required in this question rather than degraded performance or speed.
Many candidates gave answers relating to software development issues which are common to any platform.
There were many good responses to this question. Other candidates found explaining limitations more challenging.

Question 4

(a) (i) A significant number of candidates appeared to understand this topic. Many were able to explain why it was valid. Many answers simply stated 'it is valid because it fits the syntax diagram'. Candidates often lost one of the available marks by omitting to state that both 3 and 2 are digits.

(ii) Most of the candidates scored marks for the order. They often correctly identified 32 as an unsigned integer, but 5 was only identified as a digit. There was no mention that a single digit is a valid unsigned integer.

(b) A significant number of candidates scored full marks. Many incorrectly included the decimal point in the chevrons. Most candidates scored the mark for completing the <digit> line.

(c) (i) Many candidates created good diagrams. A minority needed to study syntax diagram and learn how they can draw one.
Common errors included:

- the omission of the option for 'no sign' from the <sign> diagram.
- the E was not contained in a circle.
- the omission of the line to indicate that the expression may not have an exponent expression.

(ii) Many candidates had included all the signs and Es in chevrons.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

Question 5

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

(b) A minority of candidates successfully answered this question. Candidates need to develop their understanding of flip-flops.

(c) (i) Many candidates stated that the additional input would be the clock pulse. A common misunderstanding was to state this was a carry bit.

(ii) Most candidates were able to give one limitation, which was the unstable state. Many were not able to identify both limitations. In most cases the second answer was a rewrite of the first.
The correct statement that the S-R flip-flop has a set of inputs which produce an unstable state was often followed by answers that did not adequately explain how the JK flip-flop overcomes this.

Question 6

(a) Humidity sensor was by far the most common answer. A number of candidates gave temperature sensor as the answer, even though it was given in the question. Many candidates were not able to justify their choice.

(b) Many candidates wrote about the user being able to keep a check on conditions because of the feedback reports from the computer. Few candidates were able to convey the idea that this is a continuous process that effectively controlled the system.

(c) (i) Candidates need to develop a better understanding of a parameter. There were many vague answers, such as ‘temperature’. Candidates were expected to convey ideas such as the 'ambient temperature'.

(ii) Many candidates misunderstood what was required and instead described the processes ‘by reference’ and ‘by value’.

(d) (i) Most candidates were able to identify the required bit pattern from the array and convert this to denary value 20.

(ii) Many candidates provided the correct instructions. Others did not use the ' #' sign, or used LSL instead of LSR, or put the 4002 in chevrons.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/33
Written Paper

Key messages

In order to be successful on this advanced theory paper, candidates need to show an in-depth study of the topics and make good use of appropriate technical terminology. Candidates, who have studied the theory and have also practised the precise use of these tools and techniques, were able to demonstrate successfully how they could be used to solve the problem set on the examination paper.

Candidates need to show good examination technique by answering the question as set on the examination paper in the space provided for the answer or clearly indicating where the answer is to be found on the examination paper.

General comments

There was some evidence in this examination that many candidates had not read questions carefully before attempting to write an answer. For example in Question 1(c)(ii), the instruction is 'Explain why….' and in Question 1(c)(iii), the instruction is 'Explain how….'. These instructions require different types of answer; reasons why for Question 1(c)(ii) and an explanation of how the task would be completed for Question 1(c)(iii).

Candidates answering questions where some information is provided as part of the question need to take care that they do not repeat this information as part of the answer. For example, in Question 4(b) the first three steps of the handshake protocol are given in the question and cannot be used as part of an answer.

Comments on specific questions

Question 1

(a) Many candidates correctly completed the diagram for a star topology. Many had drawn lines to the server rather than the switch.

(b) This part of the question was well answered with many responses correctly identifying whether all each of the four statements was true or false. The second statement in the list was incorrectly identified most often.

(c) (i) Most candidates correctly identified the device as the switch or the server. Many of these candidates were not able to provide a good reason. An example of a suitable reason provided for the switch is 'the switch is directly connected to all the computers'.

(ii) Many candidates found this part of the question challenging. Candidates needed to explain why the router was required. For example, 'to forward packets between the LAN and the internet'.

(iii) Many responses included some explanation of how the packets are transmitted from the router to the web server. Few responses included sufficient detail to gain all three marks available.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 2

(a) Most candidates could correctly match a description to at least one appropriate type of computer architecture. Better responses correctly matched at least three of the four descriptions to the appropriate computer architecture.

(b) Many responses correctly identified that there was only one separate processor.

(c) Many candidates found this part of the question challenging. A small number of candidates gave sufficiently detailed answers. An example of an answer that would gain both marks is 'split the program into blocks of code that can be processed simultaneously by different processors'.

(d) Many candidates found this part of the question challenging. An example of an answer that would gain both marks is 'communication between processors is a hardware problem as each processor needs a link to every other processor'.

Question 3

(a) (i) This question was generally answered well.

(ii) This question was generally answered well.

(iii) This question was generally answered well.

(b) Responses that showed confidence in the use of Backus-Naur Form (BNF) notation were generally correct. Many other responses did not show the correct use of the notation. Common errors seen included the incorrect use of '::=' instead of ':= ' for assignment and the incorrect inclusion of '< >' around terminal symbols.

(c) Responses that showed confidence in the use of syntax diagrams were generally correct. Other responses did not show the diagram drawn correctly. Common errors included the incorrect use of backtracking and not including the case without digit in the syntax diagram for a variable.

(d) Many candidates found this part of the question challenging. Few candidates gained full marks. A common error was to incorrectly put '< >' around the decimal point in the BNF notation for a real.

Question 4

(a) (i) This question was generally answered well.

(ii) The majority of candidates correctly identified that the purpose of Transport Layer Security(TLS) is to provide secure communication over a network. Further explanation proved challenging for many candidates. Better responses included the two-layer composition of the protocol, and the use of encryption.

(b) Responses that showed understanding of how public and private keys are used during the handshake process gained good marks for this question. At this level, candidates need to be able to provide a clear outline of the use of these keys to establish a session key. An outline was clearly requested in the question and illustrated by the provision of the first three steps in the process, so the candidates were shown what was required. Credit could not be given for the inclusion of these steps in a response.

(c) There was a full range of marks for this question. Common correct answers included on-line banking and on-line shopping.

Question 5

(a) (i) The majority of responses showed a correctly completed truth table.

(ii) This question was generally answered well. A common incorrect response was to repeat the pattern for a two input NAND gate with zero output for a 0 0 1 input.

(b) (i) There was a full range of marks for this question with no real pattern.

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(ii) The explanation of the problem shown in the final row of the table in part (b)(i) proved challenging for some candidates. Responses needed to contain detailed explanation in order to achieve high marks. For example, 'the flip-flop becomes unstable as Q and $\overline{Q}$ should be complements of each other'.

(c) (i) There was a full range of marks for this question.

(ii) The explanation for why the JK flip-flop is an improvement on the SR flip-flop proved challenging for some candidates. Responses needed to provide a detailed explanation in order to achieve high marks. For example, 'SR flip-flop inputs may arrive at different times, whereas a JK flip-flop incorporates a clock pulse for synchronisation'.

(d) Many responses showed understanding that flip-flops can be used as storage. In order to achieve high marks, responses needed to be more detailed. For example, 'a single flip-flop can be used to store one bit'.

Question 6

(a) (i) This question was generally answered well.

(ii) This question was generally answered well.

(b) Many responses correctly identified two other devices. Providing a justification that clearly related to the control system described in the question proved more challenging for most candidates.

(c) (i) Responses that showed confidence in the dry running of assembly language code were generally correct. Many other responses showed little understanding of this technique and gained few or no marks.

(ii) Responses needed to show an understanding of the use of the register, `LOWREG`, to indicate a sensor reading below the minimum temperature. This did not seem to be fully understood. Many incorrectly stated that 32 was the minimum temperature allowed.

(iii) Responses needed to show an understanding of what the assembly language code would have to do to turn on the heaters in those areas that are below the minimum temperature. This did not seem to be fully understood.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/41
Written Paper

Key messages

Candidates need to demonstrate a better understanding of different programming paradigms including write clauses in declarative language, complete assembly language programs and writing object-oriented program code.

General comments

The majority of candidates made good attempts to answer most of the questions, and demonstrated a good understanding of a range of skills across the variety of programming languages and problems presented. Candidates struggled with Jackson Structured Programming (JSP) diagrams. Few candidates demonstrated an understanding of how to produce a JSP diagram. Many candidates drew flowcharts instead.

Candidates are still struggling to write comprehensive object-oriented code, although an improvement has been seen in the ability to declare a class, the writing of constructors. Candidates need more experience of writing get and set methods through practical exercises.

Comments on specific questions

Question 1

This question was answered well. The majority of candidates were able to correctly complete the diagram with appropriate stages using the descriptions given.

Question 2

(a) (i) Most candidates correctly identified that an asterisk (*) is used. Fewer candidates were able to identify how this is shown, i.e. the location of the asterisk.

(ii) Most candidates correctly identified that a circle is used, but fewer were able to identify how this is shown, i.e. the location of the circle.

(b) A minority of candidates were able to draw a JSP diagram. There were many unusual diagrams, including a large number of flow charts. Candidates need to have experience of drawing JSP diagrams. They need to indicate selection and iteration in appropriate places to identify where choices can be made, and where an action is repeated. Some candidates appeared to use a structure diagram, but added inappropriate selection and iteration symbols. Candidates need to ensure they are using the identifiers given in the question, for example, x and y are the two inputs, therefore these need to be used within the diagram.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 3

(a) Most candidates were able to correctly answer this question. Common errors included the inappropriate use of capital letters, for example 'Mimi' instead of 'mimi'.

(b) Most candidates were able to provide both correct answers. Some candidates incorrectly added an `AND` between each item.

(c) Most candidates were able to correctly answer this question. Some candidates had minor syntax errors, and some candidates attempted to introduce a `notDislikes` goal, which was not defined in the question.

Question 4

(a) Most candidates who attempted the question gained a large proportion of the marks available. Some candidates attempted to increment `ATTEMPS` directly, instead of incrementing the accumulator (ACC). Some candidates missed the final missing output at the end of the program.

(b) Few candidates were able to identify how to multiply by 4, with many attempting to use an op code, `MUL`, which was not given as a useable op code. Some candidates correctly used `LSL`, but gave incorrect numbers, for example `#3` for the division. Candidates need to be careful to ensure they are using the correct spelling and case for labels that are given within the program, for example, `NUMBERS` as opposed to `NUMBER` or `Number`.

Question 5

(a) (i) The majority of candidates correctly identified an appropriate project management tool.

(ii) Most candidates gave appropriate ways that the identified tool could be used. Some candidates described the diagram and how it is created. This did not answer the question of how a manager would use it. Many candidates were able to explain how it was then used.

(b) (i) and **(ii)** The majority of candidates gave the correct type of testing for both questions.

Question 6

(a) Most candidates were able to declare the class and the parameters. Some of these candidates correctly declared the variables as private. Many candidates had problems writing an appropriate constructor method, and generating appropriate random numbers within this constructor. Most candidates were able to set `Score` to 0. Some candidates were unaware of the function of set and get methods, and some candidates made errors such as declaring a procedure as a function of vice-versa, or setting the parameter to the property value within a set method.

(b) Few candidates were able to initialise the grid to an appropriately blank value. There are various methods that could be used to do this. Few candidates seemed familiar with creating instances of a class, and thus struggled to create a new instance of animal. Those that did were successful in writing it to the array. More candidates were able to gain the mark for generating the food and initialising `StepCounter` to be 0.

(c) (i) Candidates generally found this question challenging. Many candidates read two values in as parameters instead of the one identified in the question. Candidates often checked the value against inappropriate values, for example, not checking the actual bounds, or checking <0 instead of = 0. Many candidates then returned a –1, 1 or 0 without generating it randomly, for example, if the value was = 0, they returned 1 instead of generating either 0 or 1. Many candidates were able to return the value they generated (whether correct or incorrect).

(ii) Most candidates gave the correct procedure heading. Some candidates successfully called the function from **(c)(i)** with a suitable value as a parameter. Fewer candidates successfully added this to the `Across` and `Down` values. Many candidates simply replaced their values with the return value. More candidates were then able to check the grid location. Some candidates could not identify `'F'` as the letter used to represent food, with many missing the speech marks to identify the string value.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

(d) A minority of candidates were able to explain the meaning of a "program library". Many candidates identified that it keeps the code or methods defined rather than it merely stating that it contains programs. Candidates also needed to explain how the library is actually used.

eduresourceza.com

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/42
Written Paper

Key messages

It is essential that candidates practise object-oriented programming. They need to experience writing classes and constructors in their chosen language. Programming and pseudocode questions from past papers and those provided in the pre-release paper should provide ideal topics for practical work.

General comments

The majority of candidates made good attempts at the majority of questions and demonstrated a good understanding of a range of skills across the variety of programming languages and problems presented. In general, candidates did particularly well with the PERT diagram and assembly language questions, and most candidates picked up a significant proportion of the marks available. The object-oriented programming question proved most challenging, especially in writing the code to declare a class or a constructor. Many candidates appeared to be unaware of get and set methods, and how these are used within a class.

Comments on specific questions

Question 1

(a) There were good responses from those candidates who carefully worked through the scenario. There were a range of symbols used within **Actions**, all of which were acceptable (although a single tick or cross is preferable).

(b) Candidates found this question challenging. Many candidates were not able to simplify a solution (by completing all the columns). Many candidates gave Ns in the conditions, stating that an N was required in that position; when instead, either a Y or an N could exist, therefore making their actions incomplete. Some candidates made a good attempt at starting the simplification. Many of their solutions still had redundancies or excessive information.

(c) Many candidates correctly followed the example to explain how they had performed their simplification. A large proportion of candidates attempted to explain how columns 5, 6 and 7 were simplified because this was given as an example. This was not the case because these columns were not simplified; they were an example to help guide students in how to present their solutions. Some candidates went further and were able to justify their simplification, by referring to the conditions or actions that were not relevant.

Question 2

(a) Many candidates followed the examples already given, and correctly ordered the activities. Some candidates did not understand the purpose of the dummy activities. They incorrectly added activities and times to these lines.

(b) Some candidates clearly named dummy activities. Other candidates attempted to explain what they meant, but struggled to do this, for example, they made inaccurate statements suggesting that the tasks did not have dependencies.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 3

(a) Many candidates correctly added the appropriate clauses. Common errors included adding capital letters in inappropriate places. If the question is using lower case then this needs to be followed through with the answers.

(b) Most candidates provided both correct answers. Some candidates added inappropriate capital letters, or did not include the underscore or added an '`AND`' between each item.

(c) (i) Many candidates were able to understand (and explain) why both statements were needed. Many candidates simply described what each statement did, rather than why both were needed. Good responses used an example goal in their question, to show that `nextTo(master_bedroom, X)` would not return `nursery` if the clause `22` was not present. Other even better responses gave an alternative solution by declaring a rule to remove the need for both clauses and justified the need for the rule.

(ii) Most candidates were able to correctly identify that the room needed to be added, and then followed through with both `nextTo` clauses.

(d) Most candidates had a good attempt at this question, with many gaining the majority of the marks. Common errors included creating a new clause for `notLocated(B,A)` but did not declare what this actually meant. They should have used a `not` and the clause `located(B,A)`.

Question 4

(a) Many candidates gained some marks for this question, most commonly for `CurrentItem` and `ItemToInsert`. Candidates need to take care and ensure their variables match the ones used in the pseudocode. For example, the use of capital letters in appropriate places, the spelling (`Number` vs `Numbers` for the array identifier), and to ensure they do not leave spaces in the middle of their identifiers.

(b) Many candidates correctly identified the size of the array. Some candidates attempted to find errors in the algorithm and thus state that these would stop the algorithm running. Candidates need to read questions carefully and identify what is required for an answer.

Question 5

(a) Most candidates were able to give suitable op code and operands in their solutions. Common errors included using incorrect loading op codes, for example, `LDD` instead of `LDX`. Some candidates incorrectly incremented `FOUND` and `COUNT` instead of ACC. Candidates need to make sure they following the identifier names carefully, such as the spelling and case used. Some candidates incorrect added '<>' around each operand.

(b) A minority of candidates were able to identify how to divide by 8. Some candidates correctly gave `LSR` and incorrect numbers, for example, `#4` for the division. Few candidates identified that the loop should not return to `START` and added a `LOOP` (or equivalent) label instead.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

Question 6

(a) Few candidates identified the inheritance described in the scenario. Those that attempted to draw the inheritance arrows often drew them the wrong way around, or did not include any arrows. Many candidates gave the new classes the same properties as the `Account` class, and some candidates attempted to write code declarations instead of following the class diagram shown. Some candidates were unable to give appropriate data types for the properties; for example, giving amount paid the data type string. Few candidates succeeded in giving all the correct properties, methods and identifying the inheritance.

(b) Most candidates were able to gain marks for declaring variables with many correctly declaring these as private. Some candidates were able to correctly declare get and set methods. Common errors included using procedures instead of functions (or vice-versa). In the set methods some candidates set the parameter to become the property value instead of the other way around.

(c) Most candidates correctly identified the variables required, and many were able to declare the class. Fewer candidates identified the inheritance in their code. Few candidates could give a correct constructor method for their chosen programming language. Candidates need to have more experience in writing object-oriented program code in their chosen language. They need to be able to declare constructors that take in parameters and then write these values to the private properties in the class.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

COMPUTER SCIENCE

Paper 9608/43
Written Paper

Key messages

Candidates need to demonstrate a better understanding of different programming paradigms including write clauses in declarative language, complete assembly language programs and writing object-oriented program code.

General comments

The majority of candidates made good attempts to answer most of the questions, and demonstrated a good understanding of a range of skills across the variety of programming languages and problems presented. Candidates struggled with Jackson Structured Programming (JSP) diagrams. Few candidates demonstrated an understanding of how to produce a JSP diagram. Many candidates drew flowcharts instead.

Candidates are still struggling to write comprehensive object-oriented code, although an improvement has been seen in the ability to declare a class, the writing of constructors. Candidates need more experience of writing get and set methods through practical exercises.

Comments on specific questions

Question 1

This question was answered well. The majority of candidates were able to correctly complete the diagram with appropriate stages using the descriptions given.

Question 2

(a) (i) Most candidates correctly identified that an asterisk (*) is used. Fewer candidates were able to identify how this is shown, i.e. the location of the asterisk.

(ii) Most candidates correctly identified that a circle is used, but fewer were able to identify how this is shown, i.e. the location of the circle.

(b) A minority of candidates were able to draw a JSP diagram. There were many unusual diagrams, including a large number of flow charts. Candidates need to have experience of drawing JSP diagrams. They need to indicate selection and iteration in appropriate places to identify where choices can be made, and where an action is repeated. Some candidates appeared to use a structure diagram, but added inappropriate selection and iteration symbols. Candidates need to ensure they are using the identifiers given in the question, for example, x and y are the two inputs, therefore these need to be used within the diagram.

Downloaded from eduresourceza.com

© 2017

Downloaded from eduresourceza.com

Question 3

(a) Most candidates were able to correctly answer this question. Common errors included the inappropriate use of capital letters, for example 'Mimi' instead of 'mimi'.

(b) Most candidates were able to provide both correct answers. Some candidates incorrectly added an `AND` between each item.

(c) Most candidates were able to correctly answer this question. Some candidates had minor syntax errors, and some candidates attempted to introduce a `notDislikes` goal, which was not defined in the question.

Question 4

(a) Most candidates who attempted the question gained a large proportion of the marks available. Some candidates attempted to increment `ATTEMPS` directly, instead of incrementing the accumulator (ACC). Some candidates missed the final missing output at the end of the program.

(b) Few candidates were able to identify how to multiply by 4, with many attempting to use an op code, `MUL`, which was not given as a useable op code. Some candidates correctly used `LSL`, but gave incorrect numbers, for example `#3` for the division. Candidates need to be careful to ensure they are using the correct spelling and case for labels that are given within the program, for example, `NUMBERS` as opposed to `NUMBER` or `Number`.

Question 5

(a) (i) The majority of candidates correctly identified an appropriate project management tool.

(ii) Most candidates gave appropriate ways that the identified tool could be used. Some candidates described the diagram and how it is created. This did not answer the question of how a manager would use it. Many candidates were able to explain how it was then used.

(b) (i) and **(ii)** The majority of candidates gave the correct type of testing for both questions.

Question 6

(a) Most candidates were able to declare the class and the parameters. Some of these candidates correctly declared the variables as private. Many candidates had problems writing an appropriate constructor method, and generating appropriate random numbers within this constructor. Most candidates were able to set `Score` to 0. Some candidates were unaware of the function of set and get methods, and some candidates made errors such as declaring a procedure as a function of vice-versa, or setting the parameter to the property value within a set method.

(b) Few candidates were able to initialise the grid to an appropriately blank value. There are various methods that could be used to do this. Few candidates seemed familiar with creating instances of a class, and thus struggled to create a new instance of animal. Those that did were successful in writing it to the array. More candidates were able to gain the mark for generating the food and initialising `StepCounter` to be 0.

(c) (i) Candidates generally found this question challenging. Many candidates read two values in as parameters instead of the one identified in the question. Candidates often checked the value against inappropriate values, for example, not checking the actual bounds, or checking <0 instead of = 0. Many candidates then returned a –1, 1 or 0 without generating it randomly, for example, if the value was = 0, they returned 1 instead of generating either 0 or 1. Many candidates were able to return the value they generated (whether correct or incorrect).

(ii) Most candidates gave the correct procedure heading. Some candidates successfully called the function from **(c)(i)** with a suitable value as a parameter. Fewer candidates successfully added this to the `Across` and `Down` values. Many candidates simply replaced their values with the return value. More candidates were then able to check the grid location. Some candidates could not identify `'F'` as the letter used to represent food, with many missing the speech marks to identify the string value.

Downloaded from eduresourceza.com

Cambridge Assessment International Education
© 2017

Downloaded from eduresourceza.com

(d) A minority of candidates were able to explain the meaning of a "program library". Many candidates identified that it keeps the code or methods defined rather than it merely stating that it contains programs. Candidates also needed to explain how the library is actually used.

eduresourceza.com

Downloaded from eduresourceza.com

© 2017