GCE

Computer Science

Advanced GCE **H446**

OCR Report to Centres June 2017

Oxford Cambridge and RSA Examinations

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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Advanced GCE Computer Science (H446)

OCR REPORT TO CENTRES

H446/01 Computer systems

General Comments:

In general, candidate responses demonstrated subject knowledge appropriate to the specification. The majority of candidates were evidently well prepared for the rigour of the examination. Some candidates found questions challenging when they were required to write CSS, SQL and programming statements.

The presentation of work was generally good. Candidates' handwriting on some scripts was difficult to read. Centres should make candidates aware that they may not gain credit for creditworthy responses if their handwriting is illegible.

Comments on Individual Questions:

Question	Comment
1a)	Some candidates did not apply the use of GPU to the scenario. Those who did, generally gained full marks for this question.
1bi)	Candidates who correctly cited paging and segmentation as the methods of dividing memory, invariably went on to achieve full marks.
1bii)	Most candidates achieved both marks on this question. Those who did not, either explained multi-tasking **or** gave appropriate examples. The question asked for both.
1ci)	Many candidates offered advantages and disadvantages of networks in general as opposed to those of a client-server over a peer to peer setup.
1cii)	To achieve this mark, candidates were required to show an understanding that firewalls monitor traffic going to and from a network, many only discussed one-way traffic.
1ciii)	Most candidates gave 'to stop malicious attacks' which was awarded as an interpretation of 'to protect company data'.
2ai)	Surprisingly few candidates achieved full marks on this question. Many received some marks but in general responses lacked detail. Centres should advise candidates that the number of marks awarded for questions gives an indication of the number of different points required in the response.
2aii)	Those candidates who scored well in 2ai) went on to achieve at least some of the marks here. Many candidates found it challenging to clearly explain how the linked list was manipulated. If the question states that 'you may use the diagram to illustrate your answer', Centres should encourage candidates to do so.
2b)	Most candidates gained some credit on this question by explaining why hash tables are better suited than linked lists for searching. Those who did not gain credit, described, in some detail, how hash tables were structured but did not apply their response to the scenario.
3a)	This question was well received by most candidates, invariably scoring most marks.
3b)	Candidates were assessed on the quality of their extended response in this question. Most candidates could describe each of the given types of compression appropriately, with many applying them to the scenario. Many candidates correctly concluded that dictionary encoding was the most appropriate in this case but few then went on to give clear and appropriate justification for their assertion. In general, most candidates scored well on this question.

Question	Comment
4 a, bi, bii)	In general, most candidates achieved all of the available marks in these questions.
4c)	Some candidates lost credit on this question by omitting to mention encryption.
5ai)	Surprisingly few candidates gained full marks on this question. Many responses did not use appropriate assembly language terminology e.g. label, memory location.
5aii)	Very few candidates did not gain full marks on this question.
5bi, bii)	Most candidates identified correctly, an instruction which changed the value in the Accumulator but less then correctly identified an instruction which changed the value in the Program Counter.
5biii, biv)	Candidates invariably gave both correct output values.
6a,b)	Again, these questions were very well received by candidates with most scoring full marks.
6c)	Generally most candidates stated that two bit shifts were required but some went on to state the incorrect direction i.e. left.
6d)	Candidates whose solution was presented in a logical manner tended to score at least 4 marks on this question. Candidates used different methods to find the solution, all of which were accepted provided the logic of the calculation could be followed. Centres should advise candidates to present the layout of their responses to this type of question in a logical manner.
7a)	Well received and answered by most candidates.
7b)	Many candidate achieved the mark in part i) few achieved both marks in part ii) mostly stating as opposed to describing the advantage e.g. 'those who gain unauthorised access cannot access passwords' without going on to say 'hash functions are one way'.
7c, d)	In most cases, candidates who achieved marks in c) went on to achieve marks in d) with few candidates achieving all marks in either. Many candidates did not use correct SQL statement structure or syntax e.g. confusing attribute names with string literals.
7e)	Candidates were asked to complete a function in this question. Although many students demonstrated reasonable logic in solving this problem, some output rather than returned values from the function, therefore, not gaining full marks.
8)	Candidates were assessed on the quality of their extended response in this question. Many candidates offered a balanced discussion although some of the examples used did not demonstrate that the candidate understood the difference between AI and robotic automation. Few conclusions were appropriately justified/reasoned. Many candidates scored in the mid-level band on this question.
9a)	Those candidates who achieved credit on this question, generally achieved both marks.
9b)	Few candidates scored more than two marks on this question. There was a general lack of attention to detail resulting in fundamental mistakes e.g. missing close bracket }; equals (=) instead of colon (:) when setting attributes.
9c)	Well attempted by most candidates with many scoring two out of a possible three marks. Some candidates did not gain credit in iii) because they cited *'…time taken to process'* as a disadvantage.
10a)	Most candidates gained some marks on this question but few achieved full marks. In general responses lacked attention to detail and clarity of expression. Centres should advise candidates that the number of marks awarded for questions gives an indication of the number of points required in the response.

Question	Comment
10b)	Many candidates achieved some of the available marks on this question for attempting to traverse each letter in the word and each letter in the random word - a loop with a nested loop. Some achieved more marks for comparing the current letters and outputting the length of the valid word. Fewer candidates achieved the final marks for checking if the letter was in the word or duplicated.
10c)	Very few candidates did not achieve this mark, most correctly stating the advantage '*faster to search'*.
10di)	Those candidates who cited generic advantages of using subroutines as opposed to library routines did not gain credit. The question asked for advantages to the team of using a library.
10dii)	Candidates were assessed on the quality of their extended response in this question. Many candidates explained the stages of compilation very well. Some went on to describe how code from the library becomes part of the finished program equally well. Few justified why each stage was necessary. Many candidates scored well on this question.
11a, b)	Most candidates scored well on these questions demonstrating their understanding of logic gate circuits. Some candidates simplified the circuit in part b) which achieved full marks provided the resultant circuit gave the same output.

H446/02 Algorithms and programming

General Comments:

The paper differentiated the candidates effectively and scripts included some very strong candidate responses.

Questions that targeted Knowledge and Understanding required candidates to have studied the whole specification and to have learnt the relevant definitions. Some candidates had not been prepared by covering the whole specification and thus failed to achieve marking points targeted at lower grades for basic recall.

Questions targeting Application required higher order skills to be able to use knowledge gained in context to solve problems. There was clear differentiation between candidates who understood the concepts and who could apply them, and those who displayed little ability to apply what they had learnt.

A number of candidates struggled to write pseudocode. Structured English is insufficient for examination questions that specifically require pseudocode to be written. Candidates are not required to write pseudocode to the standard presented in the specification, but would benefit from doing so.

Comments on Individual Questions:

Question	Comment
1ai	Many candidates found it difficult to apply the logic required to calculate the correct solution. Stronger candidates could do so even if they did not know the algorithm for insertion sort.
1aii	Some candidates confused insertion sort with other sorting algorithms, but many candidates gave good answers in diagrammatic form. Answers in diagrammatic form after each pass of the loop were often far clearer than prose descriptions. This form of answer should be encouraged.
1b	Whilst many candidates had some knowledge of 'Big O' notation fewer could apply it correctly within the context given.
1c	Most candidates achieved some credit, especially for a description of the bubble sort. Fewer candidates could compare the relative merits of both bubble and insertion sort in terms of the best / average / worse case.
2a	Many candidates struggled to apply the context given to computer science concepts and hence answer with the relevant properties of a linked list that would be relevant in context.
2b	Most candidates scored well in part (i), but fewer understood how the pointers in a linked list could be updated in part (ii) to allow the insertion of the new item in the next free space.
2c	Few candidates could give a clear answer in part (i) using the correct technical vocabulary that the array index/subscript could be used as the node number. Many candidates could work through the logic required in the trace table in part (ii), but fewer could actually explain what it was doing in (iii) within the context of the scenario. Part (iv) was often best answered by those candidates who used the diagram to give the solution. Candidates should be encouraged to use diagrams where they can be used to good effect rather than lengthy or vague prose descriptions.

Question	Comment
2d	Many candidates correctly identified a linear search and could justify the need for it. However, a lot of candidates did answer binary search without appreciating that the data set needed to be in order first.
2e	Most candidates achieved some credit for factual recall. However, weaker candidates often answered debugger rather than explaining the specific features of the debugger which would have been creditworthy.
2f	It was clear that many candidates had not covered the concept of concurrency and how it allows different processes to occur at the same time. Strong candidates appreciated that this could be simulated on a single core with time slicing or implemented within a parallel architecture. Many candidates lost sight of the fact that answers needed to be related to computer science rather than a restaurant chain and could not explain the underlying computer science that would allow a solution to be delivered.
3a	Part (i) was well answered where candidates had read the question stem and thought logically about the steps involved. Many candidates gained some credit in part (ii), but fewer could expand on the points they made to gain full credit.
3b	Many candidates struggled to produce good answers which could have been calculated and did not require factual recall.
3c	Many candidates scored well, but fewer scored full marks. The use of pseudocode rather than Python like syntax would have prevented errors with loop lengths.
3d	Most candidates scored some of the marks, but fewer appreciated that the characters needed to be popped from the stack initially, and that the converted characters would have to be concatenated into a string at the end of the process.
4	A number of candidates incorrectly identified the data structure as a binary tree which indicated that this was the only type of tree that they were familiar with. Descriptions of depth and breadth first traversals were often very vague, and precision in terms of the algorithmic steps involved would have produced stronger answers. A pleasing number of candidates produced the correct traversal of the tree, but of those, a number did not appreciate that the node was only output when it was popped from the stack, and hence missed location G before X was actually output.
5	Many candidates scored well in parts (a) and (b) and it was pleasing to see that recursion could both be identified and traced. Few candidates achieved full marks in part (b) because they did not appreciate that the function was inside a print statement so a final output of 2 would be produced after the value 2 was returned.
5c	Most candidates produced recognisable pseudocode. Weaker candidates produced logically incorrect solutions or did not understand the difference between an iterative and a recursive solution – reformulating another recursive solution. Where strong candidates produced good solutions they sometimes forget the necessity to have a temporary swap variable when swapping the values in two different variables over.
6a	Nearly all candidates achieved full marks after analysing the requirements in the stem of the question.
6bi	Nearly all candidates scored full marks for factual recall of the required definition.
6bii	Nearly all candidates achieved three or more marks after analysing the requirements in the stem of the question. A number gave incorrect multiplying factors for some of the required elements and thus lost marks where mathematical accuracy was required.

Question	Comment
6ci/ii	Most candidates scored some credit, but a disappointing number did not give a correct procedural declaration. The correct mathematical expression to increase the *intelligence* by 0.6% in (ii) was often incorrectly given.
6d	Many candidates struggled with the application of object oriented techniques and concepts and it was clear that many of these candidates had not had practical experience of object oriented programming. Stronger candidates did perform well and understood how to create instances from classes and how to use inheritance.
6e	Abstraction was well understood by the majority of candidates. Candidates needed to be able to give relevant examples in context and to be able to evaluate the advantages that abstraction gave to achieve marks in the top band. The level of clarity and analysis required for the top band was only seen in the strongest candidates' responses.
6f	Most candidates scored well for this section.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553