UNIVERSITY OF LONDON

CM1030

BSc EXAMINATION

COMPUTER SCIENCE

How Computers Work

Release date: Monday 15 March 2021 at 12 midday Greenwich Mean Time

Submission date: Tuesday 16 March 2021 by 12 midday Greenwich Mean Time

Time allowed: 24 hours to submit

INSTRUCTIONS TO CANDIDATES:

Section A of this assessment paper consists of a set of **TEN** Multiple Choice Questions (MCQs) which you will take separately from this paper. You should attempt to answer **ALL** the questions in Section A. The maximum mark for Section A is 40.

Section A will be completed online on the VLE. You may choose to access the MCQs at any time following the release of the paper, but once you have accessed the MCQs you must submit your answers before the deadline or within **4 hours** of starting, whichever occurs first.

Section B of this assessment paper is an online assessment to be completed within the same 24-hour window as Section A. We anticipate that approximately **1 hour** is sufficient for you to answer Section B. Candidates must answer **TWO** out of the THREE questions in Section B. The maximum mark for Section B is **60**.

Calculators are not permitted in this examination. Credit will only be given if all workings are shown.

You should complete **Section B** of this paper and submit your answers as **one document**, if possible, in Microsoft Word or a PDF to the appropriate area on the VLE. You are permitted to upload 30 documents. However, we advise you to upload as few documents as possible. Each file uploaded must be accompanied by a coversheet containing your **candidate number**. In addition, your answers must have your candidate number written clearly at the top of the page before you upload your work. Do not write your name anywhere in your answers.

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SECTION B

Candidates should answer any **TWO** questions from Section B.

The final part of all questions in this section should be answered in terms of the computer science concepts covered in this course. They will be marked according to the following rubric:

Does the answer describe an appropriate range of computer science concepts from this course?

Does the answer illustrate the concepts with a suitable example?

Does the answer explain how the computer system or data format works?

Does the answer predict how different technical choices or situations affect the system?

Question 1

(a) Give an example of a type of data that can be compressed well using run length encoding and one that cannot be compressed well. For each explain why. [6]

(b) Define encryption and give an example of how it works. [4]

(c) Give an example of where encryption might be used, explaining both why and how it is used. [4]

(d) Mobile phone based contact tracing has been used by many countries during the COVID-19 pandemic. It works by detecting when two peoples' phones are in proximity with each other. If, at a later time, one of those people is recorded as testing positive for the virus, the other is notified. Explain, using the concepts taught in this course, how you think this technology could work, including security issues. [16]

Question 2

(a) Give two uses of the System Bus, describing how each works and which parts of the computer are involved. [8]

(b) Define virtual memory and give one example that shows the advantages of virtual memory and one that shows the disadvantages. [6]

(c) My smart watch allows me to select the type of exercise I am doing. It will then make an estimate of the amount of calories I have burned during my exercise. Explain, using the concepts taught in this course, how you think this technology could work, including both hardware and software. [16]

Question 3

(a) Describe how photographs are represented at two different levels of abstraction and explain the relationship between the two. [6]

(b) For each of these network protocols, explain what type of communication it is used for, write down the network layer it acts on. [8]

- TCP
- Ethernet
- IP
- HTTP

(c) Explain, in terms of the concepts covered in this course, what happens when you buy an item of clothing online, from when you start to browse, to when the item arrives at your door. [16]

END OF PAPER

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