Introduction to Computer Systems

Department of Computer Science and Information Systems

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Spring 2020

Revision Class 2019-2020

About the Exam

- Remote

- Weight 80% (in-class test weight 20%)

- Date: Friday 29th May 2020

- Moodle Time: 14.00-18.00

About the Exam

- Downloading the Answer Book: 30 mins
- Completing answers: 3 hours
- Uploading the Answer Book: 30 mins
- Total: 4 hours (5 hours if you have an SSP)
- Uploading is not possible after the deadlines

About the Exam

- Open book – but no copying or collusion

- 9 questions, 100 marks

- Marks awarded for understanding the material, correct working and sound arguments.

About the Exam

- Download an Answer Book (Word) containing the questions

- Write your answers in the Answer Book

- Upload the Answer Book at the end of the examination.

- PDF versions of the answer book and of the examination paper in the old style can be downloaded for reference.

About the Answer Book

- Use Word if possible
- If not then use a text editor such as Libre Office on Linux, Google Docs, TextEdit on Mac.
- If possible, upload a Word version of the Answer Book
- If not, then upload a PDF version of your answer file.

Check Word

- Text formatting
- Indentation
- Lists
- Insertion of images, diagrams or pictures
- etc

Handwritten Answers

- If there is no other way then take pictures or scans of your handwritten answers.

- Option 1: Insert the pictures or scans in the Answer Book

- Option 2: save the pictures or scans in a PDF file for uploading. Any uploaded file must be less than 100MB

Name the Answer Book

- Do not put personal information in the Answer Book

- Rename the Answer Book using your student number, e.g. SN12345678ICS.docx

Hardware and Environment

- Use an adequate machine

- Obtain a reliable broadband connection

- Consider a back up connection, e.g. Mi-Fi device or dongle (aka pocket WiFi) or a tether to a mobile Phone.

- Find a comfortable quiet room

- Print out the questions if it helps

In Case Things Go Wrong

- If uploading fails, then send your file as an attachment to submit@dcs.bbk.ac.uk

- For technical queries contact ITS, e.g.

    logging into Moodle

    scanning handwritten work

 email: sd@its.bbk.ac.uk

 phone: 020 3926 3456

Prepare for the Exam

- Study the lecture slides

- Check the syllabus: week 1b and weeks 2-8

- Refer to the book: Computer science: an overview.

- Study past papers: check the electronic library and the ICS web page.

ICS Syllabus Week 1b

- Definition of an algorithm

- Variables, q = 5

- Algorithms for quotient and remainder, 25 = 3*7+4

Week 2a (Representations of Integers)

- Powers of 10
- Decimal representation of integers
  - 381= 3*100+8*10+1
- Powers of 2
- Binary representation of integers,
  - 1101 = 1*8+1*4+0*2+1
- Powers of 16
- Hexadecimal representation of integers,
  - A5F = 10*256+5*16+15

Week 2a (Continued)

- Addition:

    1101+1 = 1110

- Multiplication:

    1101*11 = 1101*(10+1)
     = 1101*10+1101*1
     = 11010+1101
     = 100111

Week 2b (Excess and TC)

- Excess notation

    1-> add 4 ->101

- Two's complement notation

    1->rightmost three bits of $2^{(3)}+1 = 001$

    -1->rightmost three bits of $2^{(3)}-1 = 111$

- TC and subtraction

Week 3a, Boolean Operations

- >, >=, ==, !=, <, <=
- Truth values
- Truth tables (AND, OR, NOT)
- Combinations of Boolean operations

    NOT(A OR B)

    NOT(A) AND NOT(B)

Week 3b (Floating Point)

- Binary fractions 100.11
- Standard form

$$\pm 2^r \times 0.t$$

- Round off errors

Week 4a (Hardware)

- Hard disk, tracks, sectors
- Seek time, latency, access time
- Data rate
- Compact Disk
- Magnetic tape, flash memory, RAM

Week 4a (Continued)

- Computer Architecture

- Von Neumann bottleneck

- Machine cycle

Week 5b (Instructions)

- Types of instruction 156C, 256C

- Op code 7 (OR)

- Machine language

- Machine cycle

Week 6b (Arrays)

- Definition of an array
- Two dimensional array
- Array indexing
- Address polynomial

  5x5 array A, A[i, j] stored at x+5*i+j
- Algorithms involving arrays

Week 7a (Pointers)

- Definition of a pointer
- Definition of a linked list
- Add an element to a linked list
- Remove an element from a linked list
- Pseudo code for pointers
    - f1.data = 5,
    - f1.pointer = memory address 10011011

Week 7b (File Management)

- Sequential file
- Merging of sequential files
- Index file
- Hash file
- Hash function
- Bucket
- Collision

Week 8a (Pseudo Code)

- Assignment
- Conditional selection
- Repeated execution
- Function
- Parts of a function

Week 8b (Algorithm Design)

- Bottom up design
- Top down design
- Search a sorted list
- Iteration, sqrt(2)
- Ferry problem