THIS PAPER IS NOT TO BE REMOVED FROM THE EXAMINATION HALLS

UNIVERSITY OF LONDON **CO3346 ZA**

BSc Examination

CREATIVE COMPUTING

Sound and music

Date and Time: Friday 6 May 2016 : 14.30 - 16.45

Duration: 2 hours 15 minutes

There are FOUR questions in this paper. Candidates should answer **THREE** questions. All questions carry equal marks, and full marks can be obtained for complete answers to a total of **THREE** questions. The marks for each part of a question are indicated at the end of the part in [.] brackets.

Only your first THREE answers, in the order that they appear in your answer book, will be marked.

There are 75 marks available on this paper.

A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics text or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

Question 1 Computational models of music cognition

(a) What is a monogram model of pitch sequences? [3]

(b) Draw a table showing how a monogram model might represent the pitch sequence A, A, B, D, D, A. [4]

(c) What is the purpose of using a monogram model in generative mode? [2]

(d) Write pseudo code explaining how you would run a monogram model in generative mode. [6]

(e) What is the purpose of a probe tone experiment? [2]

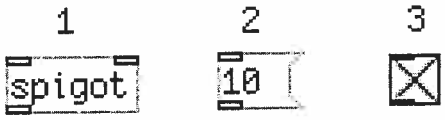
(f) How is a probe tone experiment carried out? [3]

(g) What are the input and output of the Krumhansl-Schmuckler key-finding algorithm? [2]

(h) Describe in English how the algorithm works. [3]

Question 2 Interactive sound using Pure Data

(a) Identify the basic types of the three elements in the Pure Data patch below:

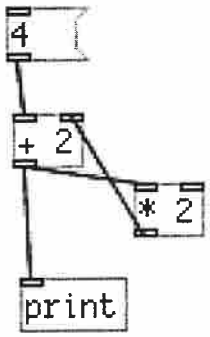


i. Element 1. [1]

ii. Element 2. [1]

iii. Element 3. [1]

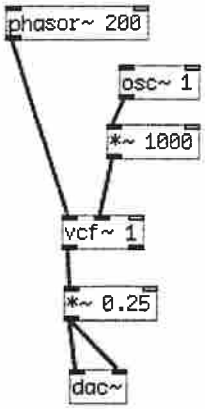
(b) What will be printed out to the Pure Data console if the user clicks on the number 4 at the top of this Pure Data patch 4 times?



[4]

(c) Describe the basic elements and wiring of a frequency modulation synthesis and a subtractive synthesis patch. [6]

(d) Describe the sound that the patch below would make. Which synthesis technique does it use? What is it about the patch that allows you to identify the synthesis technique? [4]



(e) Write a patch that generates an audio signal containing the first five frequencies in the harmonic series with an f_0 of 200Hz. It should normalise the output to prevent it from distorting. Annotate the key functional parts of your patch, explaining what they do. [8]

Question 3 Algorithmic composition

(a) For each of the following aspects of the MIDI protocol, describe its purpose, the range of values it can use and the number of bytes required to represent that range of values.

i. MIDI channel. [3]

ii. MIDI message type. [3]

iii. MIDI note number. [3]

iv. MIDI note velocity. [3]

(b) Based on the above, how many bytes are required to trigger a note on a synthesizer, which involves sending a MIDI note on and a MIDI note off message? Show your working. [4]

(c) What is the purpose of mapping when you are sonifying a particle system, as in swarm music? [2]

(d) Describe a simple mapping technique that uses only one characteristic of a particle system, that will allow you to sonify it. [4]

(e) Describe a more advanced mapping scheme that utilises more characteristics of the particle system. [3]

Question 4 Understanding musical interaction

(a) Define each of the following elements of Western tonal music:

i. Rhythm. [2]

ii. Pitch. [2]

iii. Intensity. [2]

iv. Timbre. [2]

(b) What is a musical grammar? [2]

(c) Describe the two key uses for musical grammars. [4]

(d) Give examples of musical interaction modes that fit into each of the following categories:

i. Accompaniment. [2]

ii. Human/machine improvisation. [2]

iii. New interfaces to (new) instruments. [2]

(e) Choose one of the examples you gave above, state clearly which example you chose, and briefly describe *5* technical or artistic challenges involved in the creation of such a system. [5]

END OF PAPER