THIS PAPER IS NOT TO BE REMOVED FROM THE EXAMINATION HALLS

UNIVERSITY OF LONDON **CO3346 ZB**

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 digram model of pitch sequences? [3]

(b) Draw a table showing how a digram model might represent the pitch sequence A, A, B, D, D, A. [5]

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

(d) Describe in English how you would run a digram model in generative mode, where the model contains the data you tabulated earlier. [3]

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

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

(g) What is the Krumhansl-Schmuckler key-finding algorithm? [2]

(h) Does the Krumhansl-Schmuckler key-finding algorithm take symbolic or raw audio input? [1]

(i) Give an example of the input for the Krumhansl-Schmuckler key-finding algorithm. [2]

(j) How do we know that it works? [2]

Question 2 Interactive sound using Pure Data

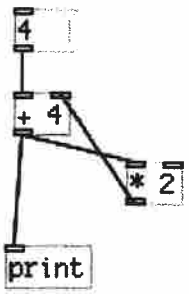
(a) Identify the basic type of the three elements in the Pure Data patch below:

i. Element 1. [1]

ii. Element 2. [1]

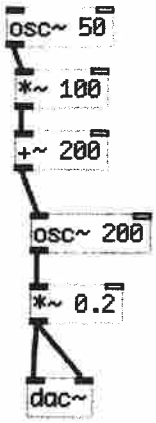
iii. Element 3. [1]

(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 sample playback and an additive 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 identify the synthesis technique? [4]



(e) Write a patch that implements subtractive synthesis, with a slow parametric modulation of some sort. 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 controller number. [3]

iv. MIDI controller value. [3]

(b) Based on the above, how many bytes are required to send a control message to a synthesizer? Show your working. [4]

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

(d) Describe a simple mapping technique that will allow you to visualise a particle system. [4]

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

Question 4 Understanding musical interaction

(a) Name and give an example of a specific type of data relating to each of the following elements of Western tonal music:

i. Rhythm. [2]

ii. Pitch. [2]

iii. Intensity. [2]

iv. Timbre. [2]

(b) Is 'The sequence must contain only notes A, B, C and E' an example of a musical grammar? Why? [2]

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

(d) A computer music researcher has attached a gyroscopic sensor to her violin which generates a stream of numbers telling her the angle she is holding her violin at, relative to the floor. She connects the output of the sensor to a sound synthesizer such that it plays notes when she moves her violin to a new angle. Which of the following categories of music interaction systems does this system fit into and why?

i. Accompaniment. [2]

ii. Human/machine improvisation. [2]

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

(e) How would you extend the violin system so that it produced a more interesting output? Describe 3 key features you would add. Does it fit into any more of the categories listed above now? [5]

END OF PAPER