



NUI MAYNOOTH

Ollscoil na hÉireann Má Nuad

OLLSCOIL NA hÉIREANN MÁ NUAD
NATIONAL UNIVERSITY OF IRELAND MAYNOOTH

MUSIC

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MA in Computer Music/HDip in Music technology

MU611 Software Sound Synthesis

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Duration: Three Hours

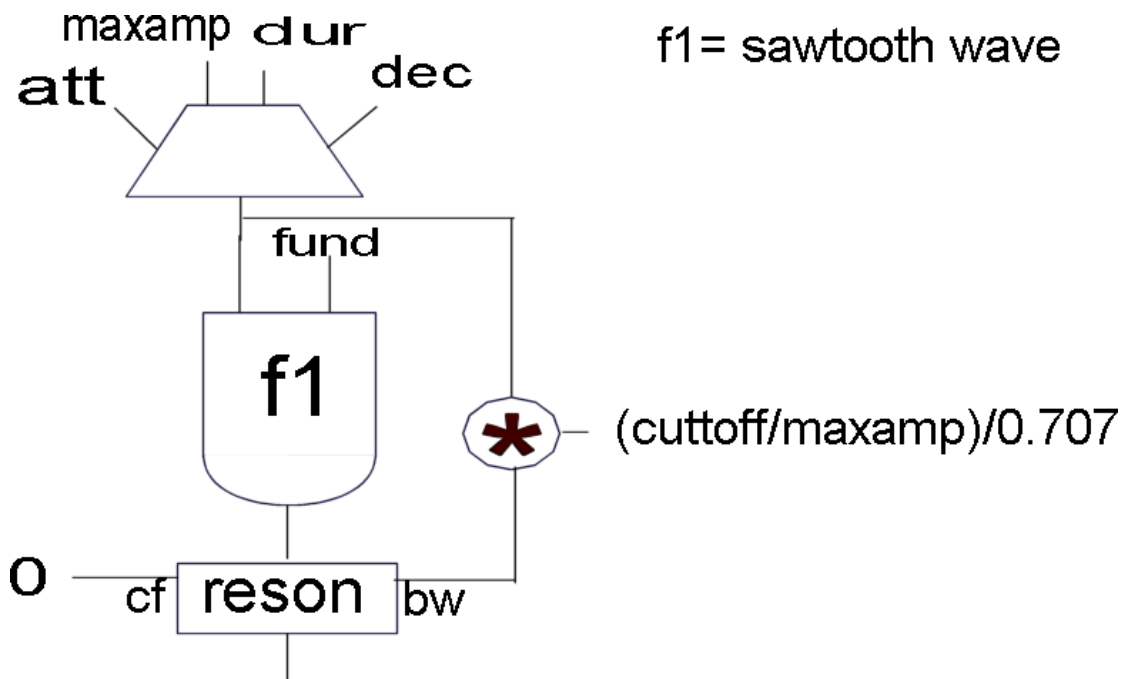
*Please answer **four** of the following five questions*

1. In relation to digital signals, please answer:
 - (a) What aspect of PCM encoding limits the dynamic range of a system?
 - (b) What is the Nyquist frequency and how does it affect the digital encoding of a signal?
 - (c) What is aliasing? Please give one example.
 - (d) Why are low-pass filters used in analog-to-digital and digital-to-analog conversion?

2. In Csound orchestras and scores, what is the function of the following components:
 - (a) orchestra header.
 - (b) instrument blocks.
 - (c) opcodes.
 - (d) I-statements.
 - (e) F-statements.

3. In FM synthesis:
 - (a) Show a simple-FM synthesis setup, using a flowchart diagram and its equivalent csound code.
 - (b) In this technique, what parameter or parameters affect the resulting timbre of the sound?
 - (c) How can we determine if the resulting sound has harmonic or inharmonic spectrum? In the former case, how can we predict the fundamental frequency of the sound?
 - (d) Describe a double-carrier FM-setup and how it can be used to generate formants.

4. Implement the following flowchart as a csound instrument (including a complete score file with a few i-statements) according to the instructions below. Provide a description of what this instrument does. A csound opcode reference summary is provided in annex to this question sheet.



5. Describe the design and operation of the channel vocoder. Please detail the code for each one of its bands. What types of sounds are best for the excitation sources? What sounds are best for spectral envelope extraction?