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Eni uillo

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ENI UILLO

by

Daniel Elias Frantz

A thesis submitted in partial fulfillment
of the requirements for the
Master of Arts degree in Music
in the Graduate College of
The University of Iowa

May 2014

Thesis Supervisor: Associate Professor Lawrence Fritts

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

_____

MASTER'S THESIS

_____

This is to certify that the Master's thesis of

Daniel Elias Frantz

has been approved by the Examining Committee
for the thesis requirement for the Master of Arts degree
in Music at the May 2014 graduation.

Thesis Committee: _____
Lawrence Fritts, Thesis Supervisor

_____
David Gompper

_____
Jennifer Iverson

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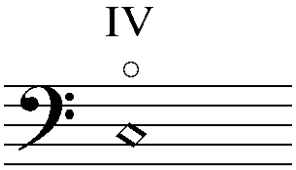
INSTRUMENTATION

2 violins
Viola
Violoncello

PERFORMANCE NOTES

The following notational conventions are used in this piece:

Natural harmonics are indicated by a diamond notehead, a harmonic circle, and a string number. The pitch shown by the notehead is the point on the indicated string to be fingered, in order to produce the correct harmonic. For example, the note written for cello, illustrated below, indicates to touch the C string at the octave, producing the first harmonic.



The players are asked to perform *sul ponticello*, as well as *poco sul ponticello*. Once these appear in a part, they are abbreviated *s.p.* and *p.s.p.*, respectively.

Poco sul ponticello signifies a playing position approximately one third to one half as far from *ordinario* as *sul ponticello*. The intended effect is a slightly brighter tone.

Pizzicati are always to be performed in an ordinary playing position.

PROGRAM NOTES

ENI UILLO is an exploration of different means of composing using cellular automata (both singular and plural are abbreviated CA). These consist of a series of *cells*, essentially placeholders which, at any given time, have a determinate state. The state of each cell in the next generation is determined by the state of that cell in the current generation, as well as the states of cells in its *neighborhood,* the cells adjacent to it. These values are compared to a set of predetermined conditions called the *rule*, and the result of this comparison becomes the cell's state in the following generation. The Game of Life, one of the most well known and studied CA, has a rule expressible as B3/S23: if the cell is 0 and has 3 neighboring 1 cells, the cell becomes 1; if the cell is 1 and has either 2 or 3 neighboring 1 cells, it remains a 1, otherwise is becomes a 0. After this determination has been made for all cells, the next generation becomes the current generation, and the process is repeated *ad infinitum*. The four movements of this work were composed using raw musical material generated by four different implementations of CA.

TECHNICAL NOTES

The raw musical material of this composition was generated by several different CA programmed in a computer music language known as *Pure Data*. Programs created in this environment are called *patches*, due to the figurative resemblance which the connections between objects bear to patch cords used in modular analog synthesizers, such as those made by Moog or Buchla. Here, as in such a synthesizer, the user connects objects together so that the function of each object, and the sequence in which they occur, creates the intended result.

The creation of musical material based on mathematical models such as I have done here is referred to as algorithmic composition. Before the form of the score can be addressed, the form that the raw materials of the composition will take has to be determined. Any particular iteration of the system that I create to realize this form must be tested, both for its confirmation or negation of my conceptual goal for the piece and for its appeal to my own aesthetics. Materials that pass these tests are then subjected to my free will, to segment, transform, and arrange as suits my goal for the composition. The realization of this goal can eventually necessitate the creation of further systems to fill perceived musical deficiencies, which can be seen in some of the descriptions below.

I. cold. A sequence of binary values, representing rests and non-rests, was created by a one-dimensional CA, shown in Figure A1 (all figures are found in the Appendix). Since each cell in a binary one-dimensional CA has two neighbors, and each cell has two possible states, there are eight possible combinations of 0 cells and 1 cells in any given calculation. These eight combinations of binary digits also equate to decimal numbers 0 through 7; in order, they are 000, 001, 010, 011, 100, 101, 110, and 111. Each set of three digits represents, from left to right, the state of the left-hand neighbor, the state of the current cell being considered, and the state of the right-hand neighbor. The occurrence of one of these states caused the *8rule_box* object, seen in the lower portion of the image, to output the corresponding binary value specified in the rule; for example, the state 000 would cause *8rule_box* to output the value 0. This particular CA was operating rule 109, so numbered because the binary string representing the eight possible outcomes under this rule (01101101) translates to that decimal number. This rule was chosen purely out of preference for the material generated by it.

The non-rests of this sequence were then filled in with pitches arrived at by an arithmetic process, creating rhythmically active material for all four instruments.

Noting the uniform character of this material, an additional patch was created to generate long notes by a randomized process, shown in Figure A2. These two families of output were then segmented and combined, governed by my compositional intuition.

II. hazy. The CA used for this movement was again one-dimensional, redesigned to be more efficient and more flexible in implementing different rules. An independent CA governed the pitch activity of each instrument. Each 0 state added a fixed, predetermined pitch, while each 1 state added a variable pitch. The pitches were then set to a stream of constant rhythms, the subdivision of which was randomized.

This movement employed several different rules, namely 30, 110, and 86 (numbered by the same process as rule 109, mentioned above). These rules were used in various combinations to create four separate sets of material, which were then assembled into the final composition. The patch containing the four CA is shown in Figure A3.

III. quietly. The CA used for this movement was two-dimensional, and employed the Game of Life rule (B3/S23) laid out in the program notes above. Rather than reading values cell-by-cell and translating those into musical information, the content of each row and column of the CA was seen as an integrated string of binary digits and translated into one decimal digit. This digit was then used to influence musical information. The result of this operation in each column determined the vertical voicing of the instruments, relative to the cello pitch, while each row determined the rhythmic duration of each resulting pitch.

A central focus of the movement, conceptually and in my usage of the CA, was a pattern known as the r-pentomino, shown in Figure A4. This pattern takes 1,103 generations to become static, meaning the only configurations of cells with value 1 will have either a periodicity of 1 ("still life") or 2 ("oscillator"). This generation is shown in Figure A5. The horizontal bars seen in the figure are oscillators, all other shapes are still lifes.

This long-lived characteristic of this particular pattern resonated with my determination to create a slow-moving movement, and influenced the method of constructing the score. The CA was consistently initialized with several r-pentominoes in randomized locations. Three sets of material were generated, and truncated as dictated by my compositional intuition. These three sets provided the foundation for the three large sections of the movement. The foundational material

of each successive section was placed below a selection of transposed material from the preceding sections, and the resulting multiple lines were merged into one by selecting material from each according to my intuition. The way in which material reappears in this movement is intended to mirror the long-lived character of the r-pentomino and the fact that multiples of this pattern were the initiating condition for the CA. The patch used in the generation of material for the third movement is shown in Figure A6.

IV. elegant. Two-dimensional CA were also used in this movement, with a different rule (B2/S23). They were again used in an interpretive manner, as in the third movement, but here a series of CA was used in this way to create different elements of the raw material. This series is shown in Figure A7. It can be seen in the right half of the image, between *pd pitch-head-ca* and *pd make-imit2*. This models visually the sequence of events involved in generating this movement's material. First, pitches were chosen by polling a randomized number of rows in the CA and converting each binary string into a decimal representing pitch class. A similar process was then triggered in *pd head-udur-ca*, this time resulting in a series of rhythmic durations. These two sets of information were combined at random to form a subject, which was assigned to one of the four instruments and set in a register of that instrument (converting the pitch class information into specific pitches).

Two sets of material were then created, taking pitch class information from the subject rather than using independently determined information. An abstract mapping of the subject was created to represent which pitch class is sounding during which unit of rhythm. Points on this map were referenced at random, and two separate CA were each polled by row, based on the pitch class returned from the subject map. The recurring high-register passages in the movement were created by the same system as the rest of the movement, but through a happy accident were uniformly in such a striking register I chose to include them as a sort of ritornello figure rather than as a part of the typical contrapuntal texture of the movement.

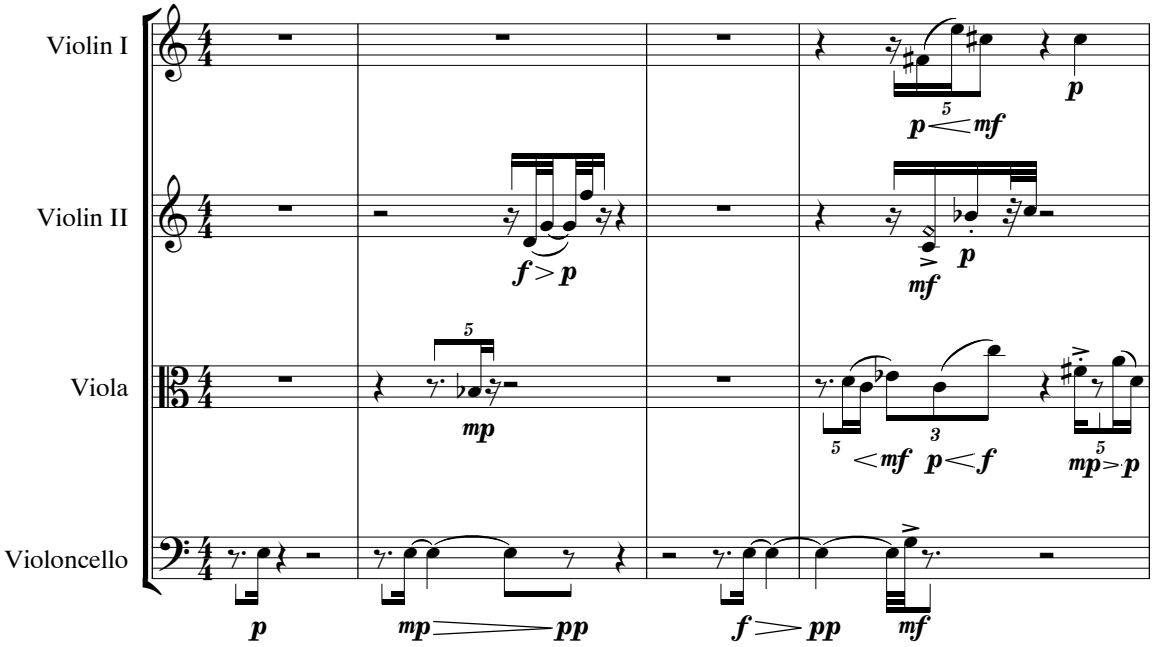
ENI UILLO

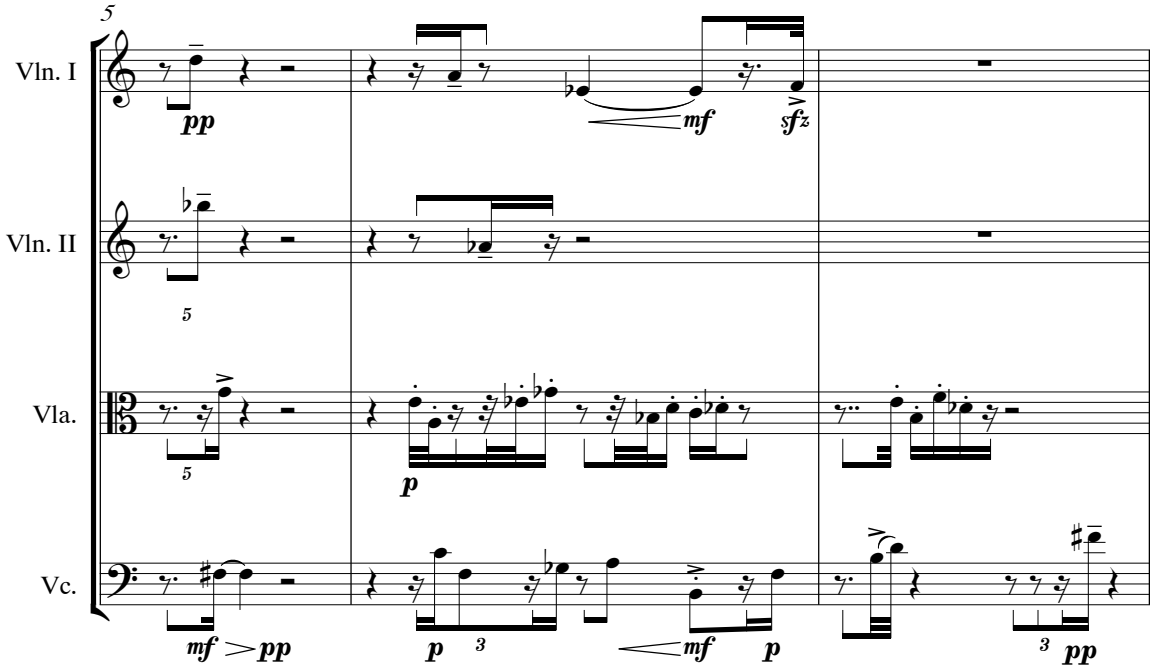
I.

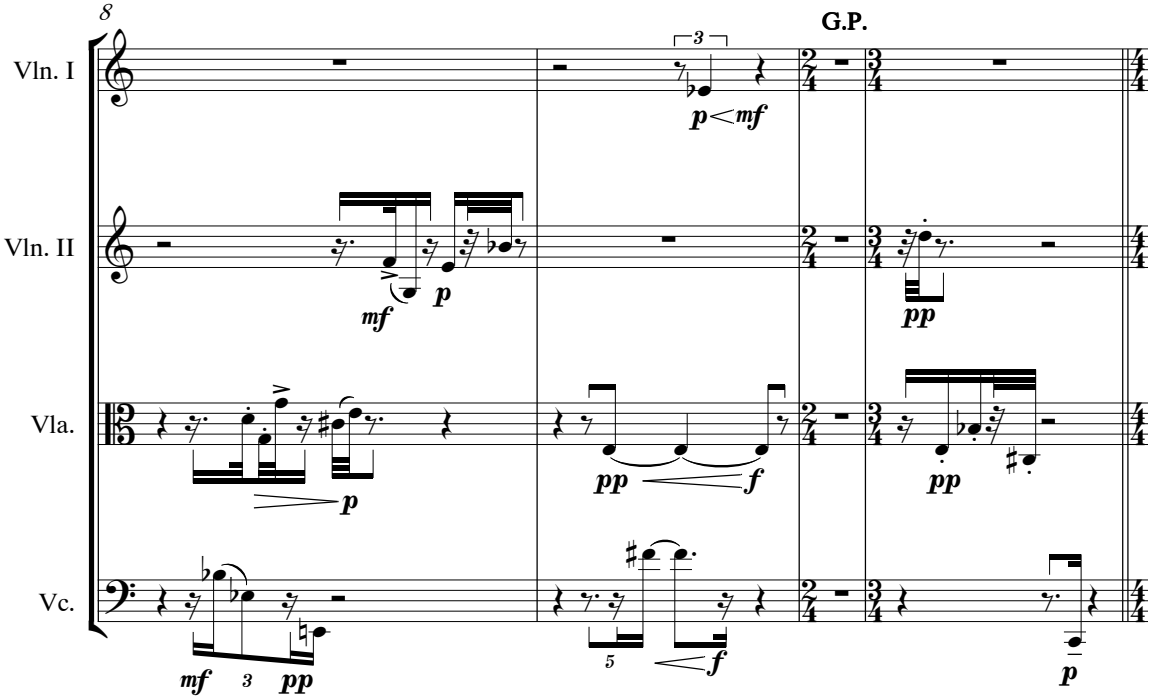
cold

♩ = 56

Daniel Frantz



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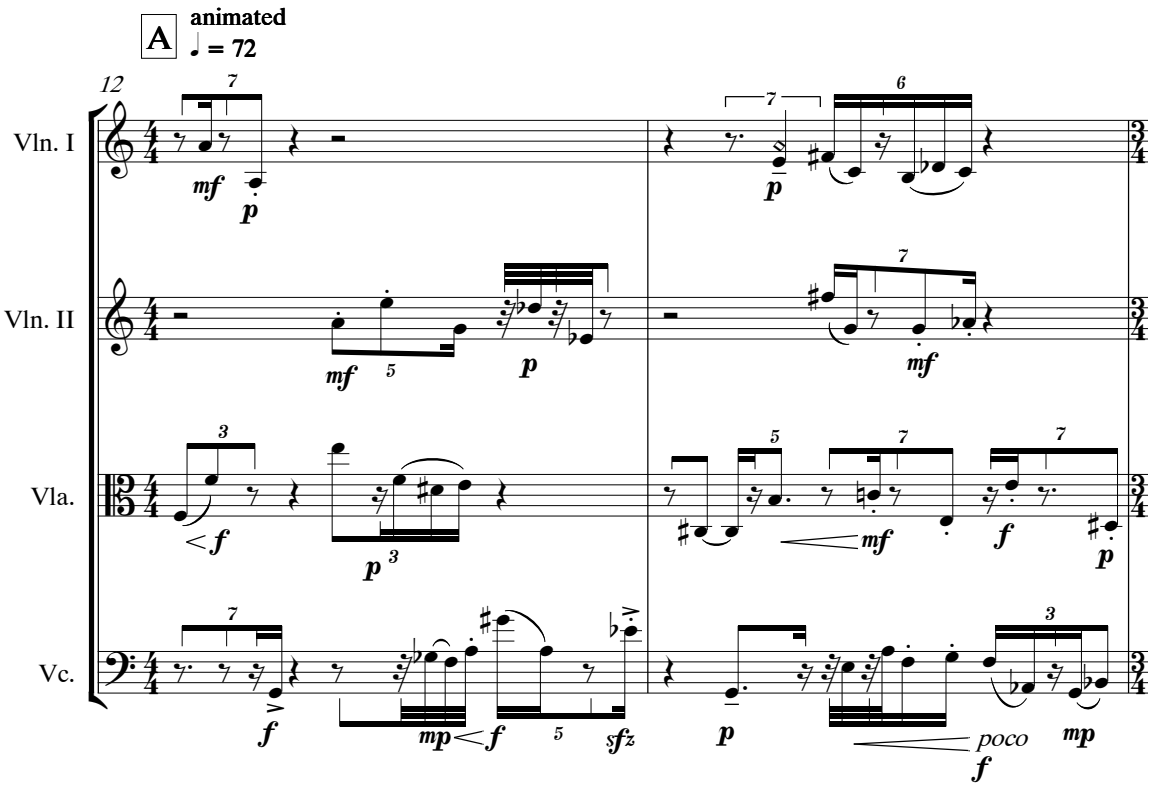
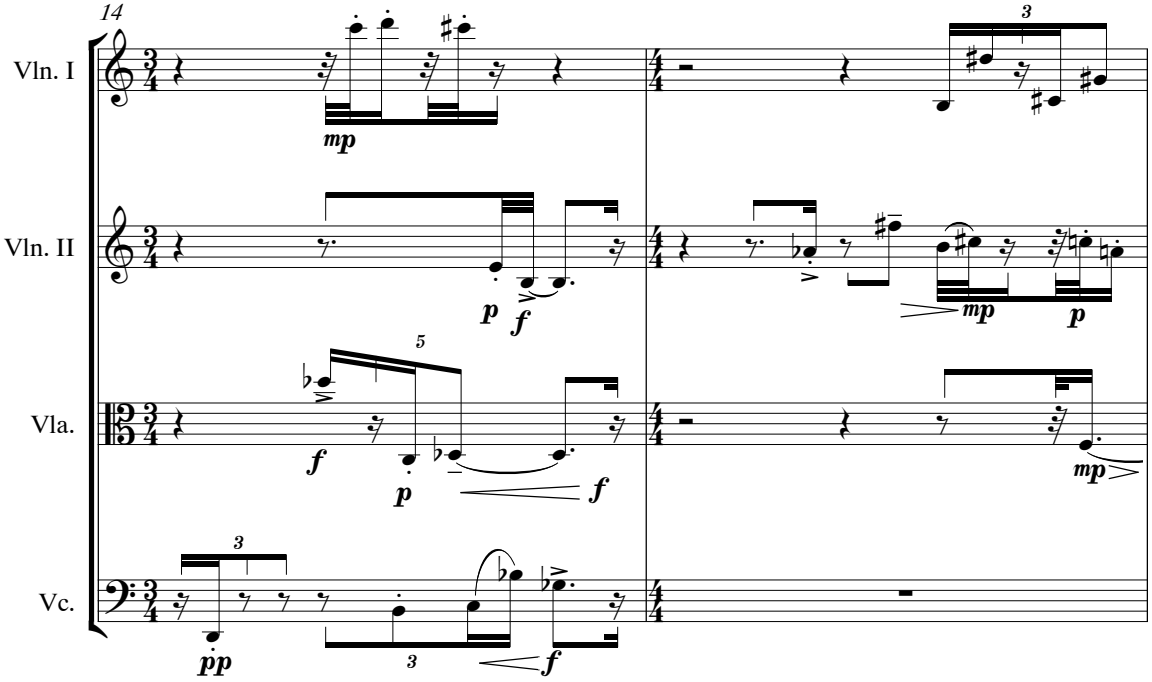
G.P.
Vln. I
Vln. II
Vla.
Vc.


A
animated
♩ = 72
12
Vln. I
Vln. II
Vla.
Vc.
poco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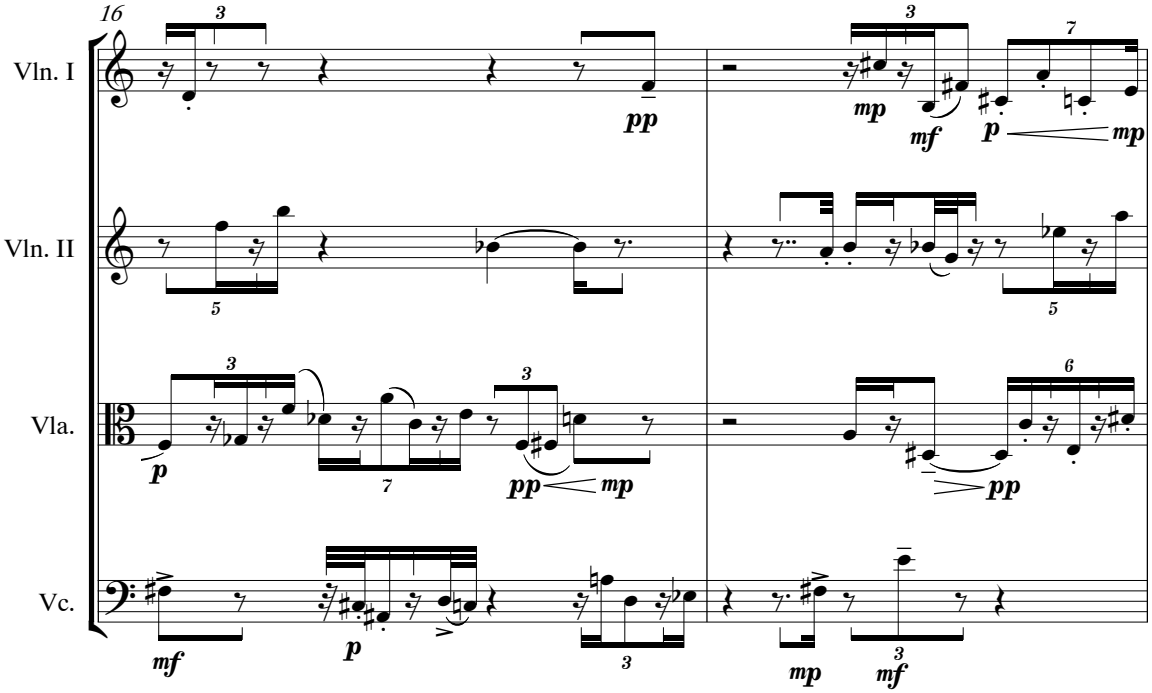
Vla.
Vc.
mp
p
f
pp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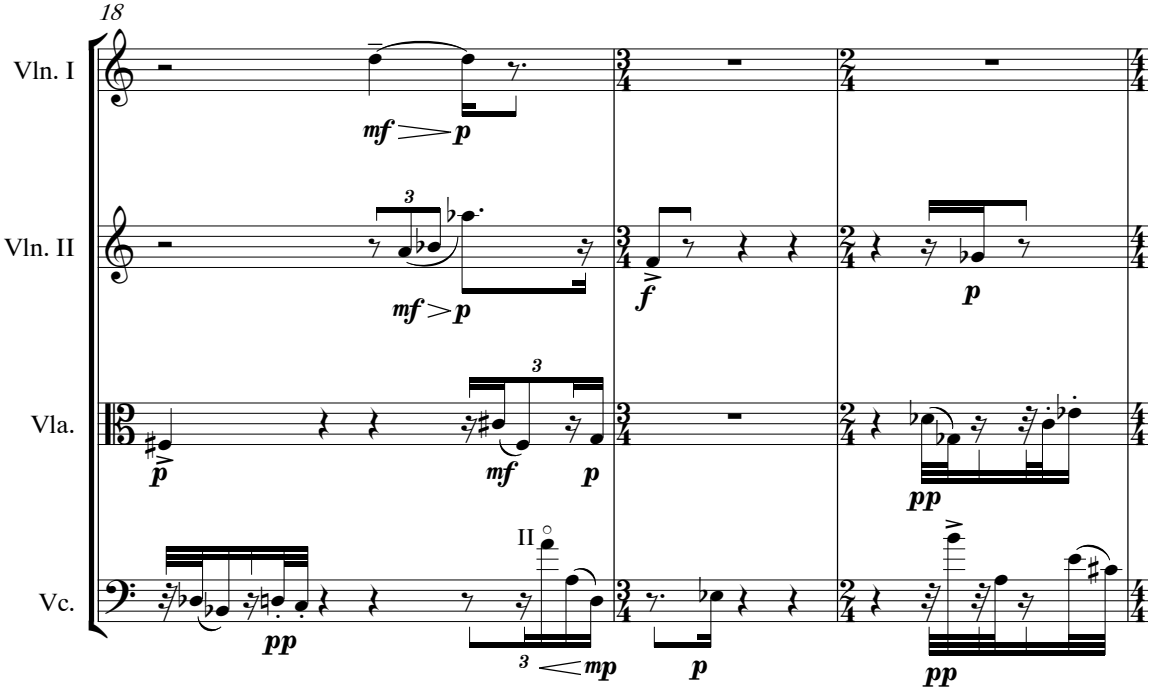
Vln. I
Vln. II
Vla.
Vc.
pp
mp
mf
p
f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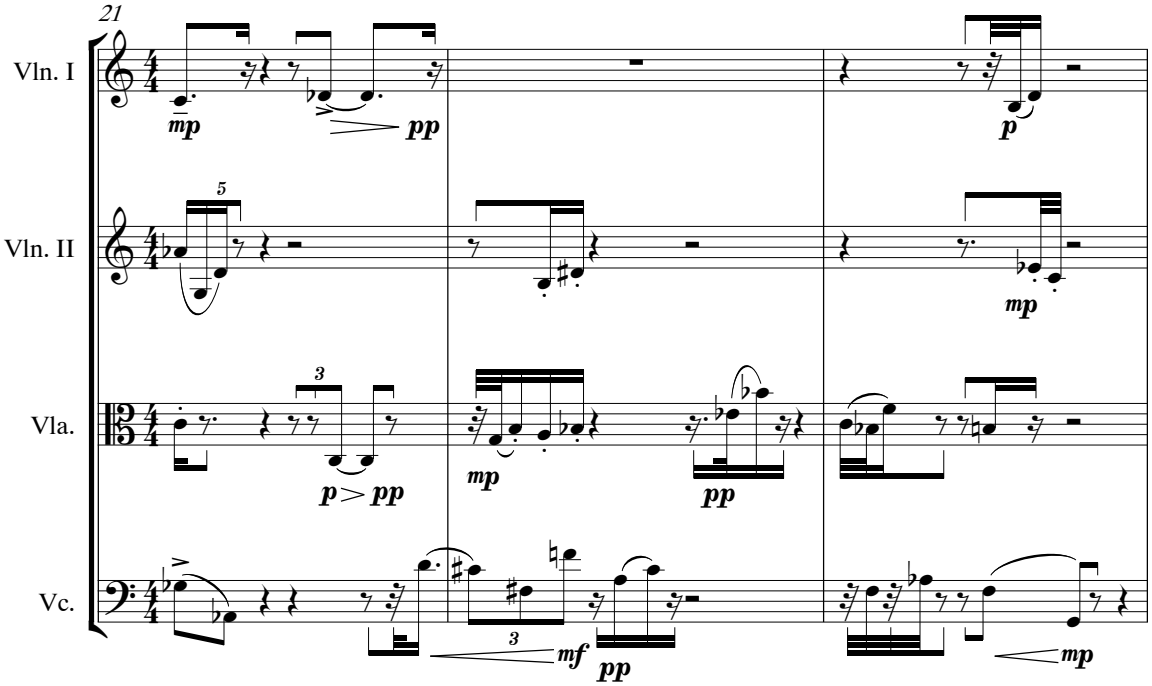
Vln. II
Vla.
Vc.
II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Vln. I
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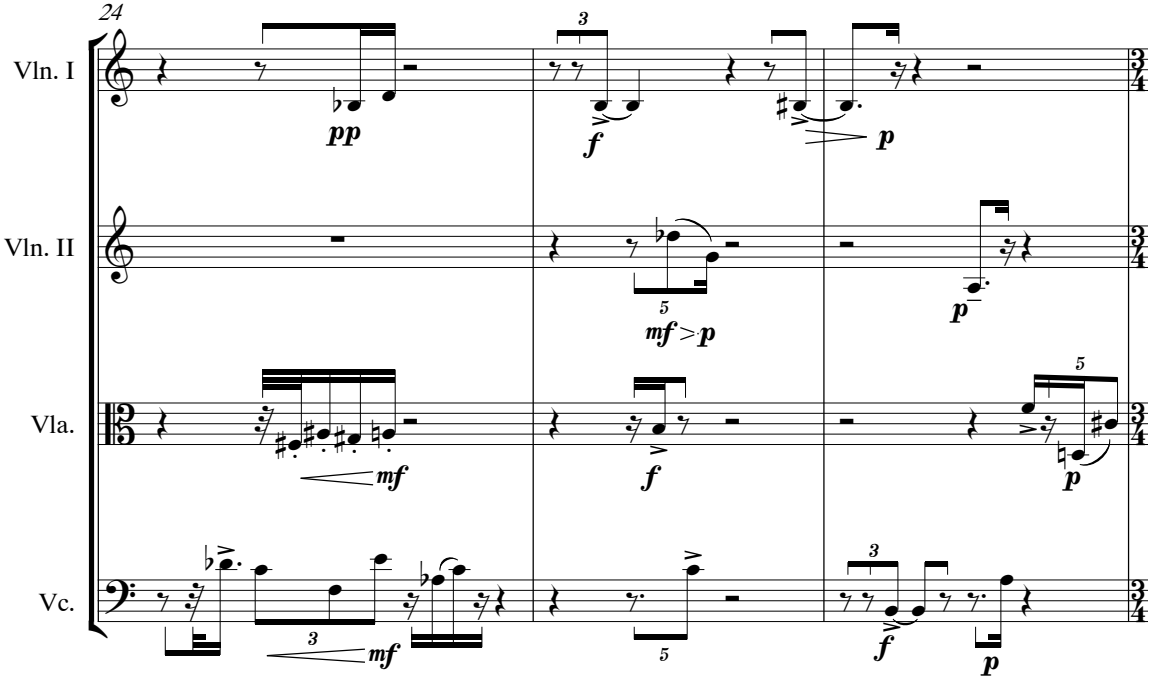
Vla.
Vc.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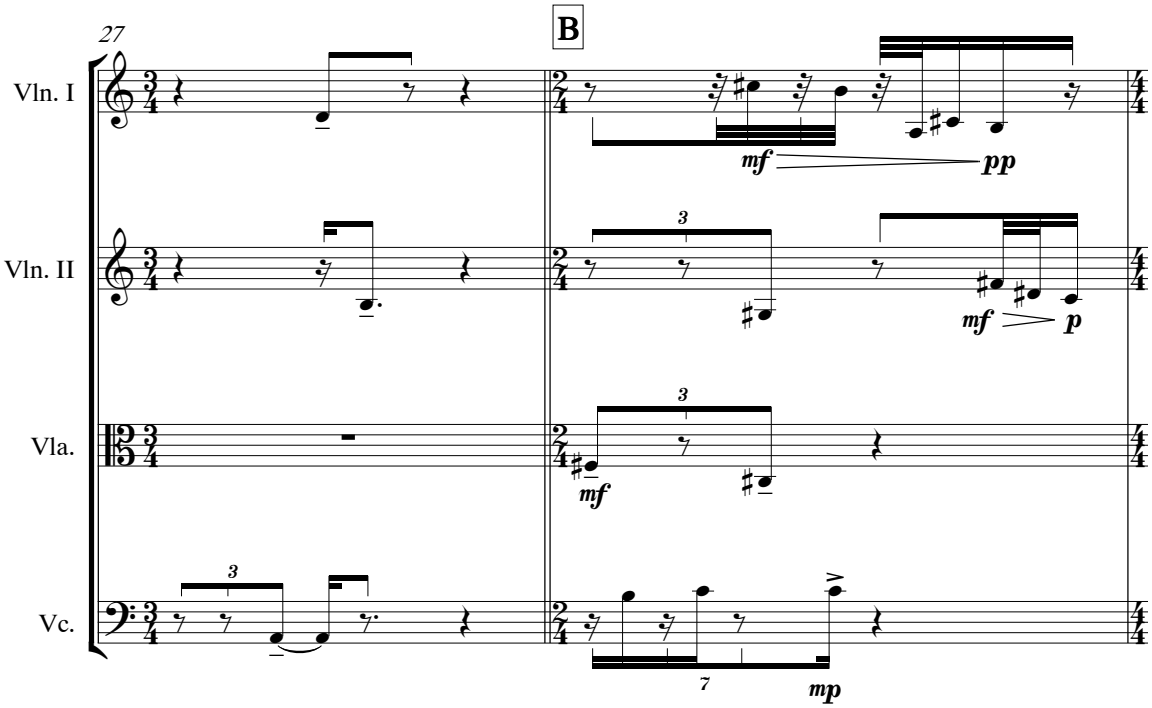
pp
f
p
mf > p
mf
f
p
mf
f
p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B
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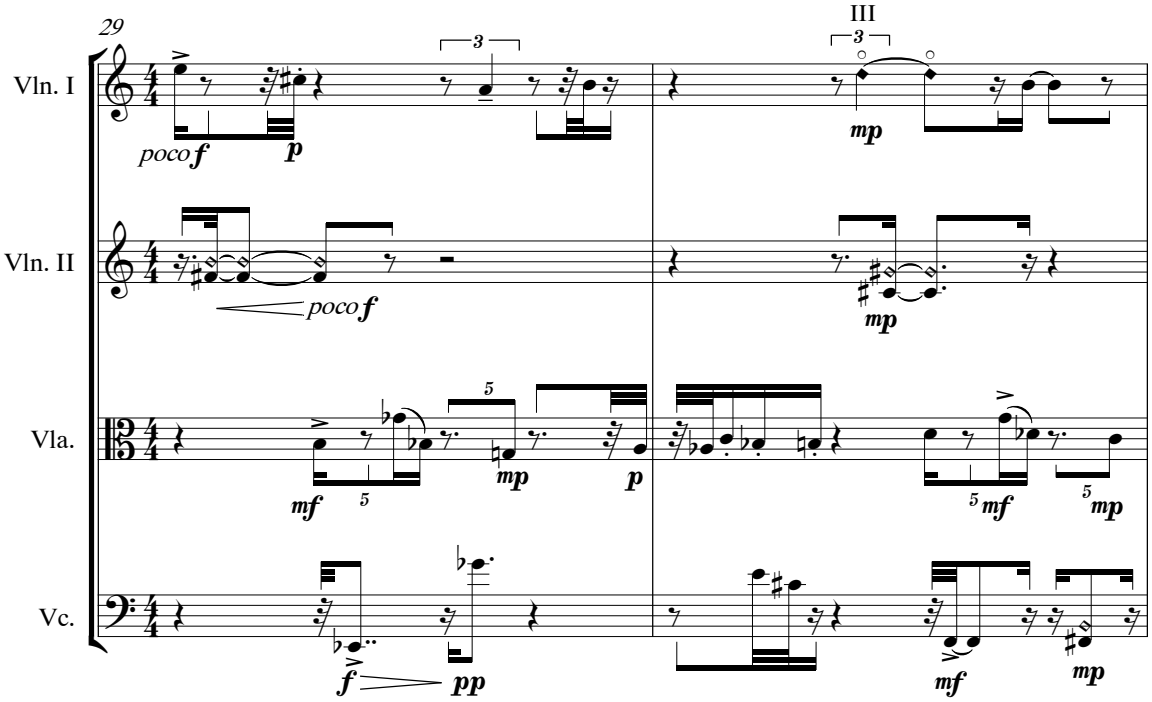
mf
p
mf
mp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III
Vln. I
Vln. II
Vla.
Vc.
poco f
p
mp
poco f
mf
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mf
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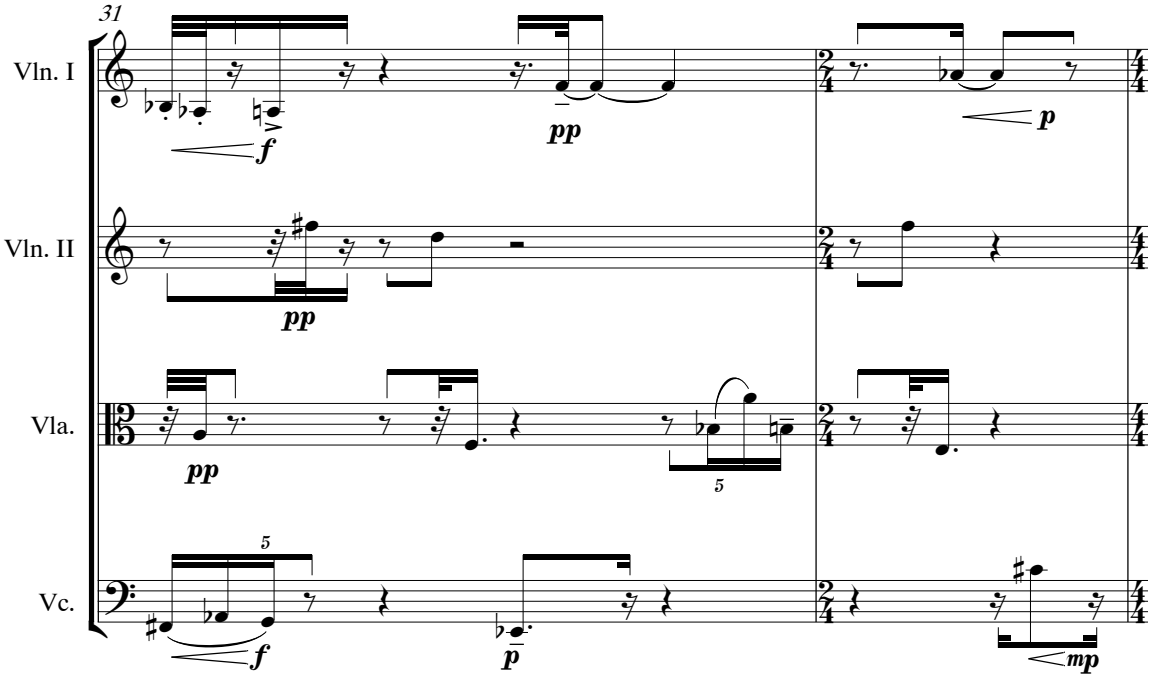
f
pp
mf
mp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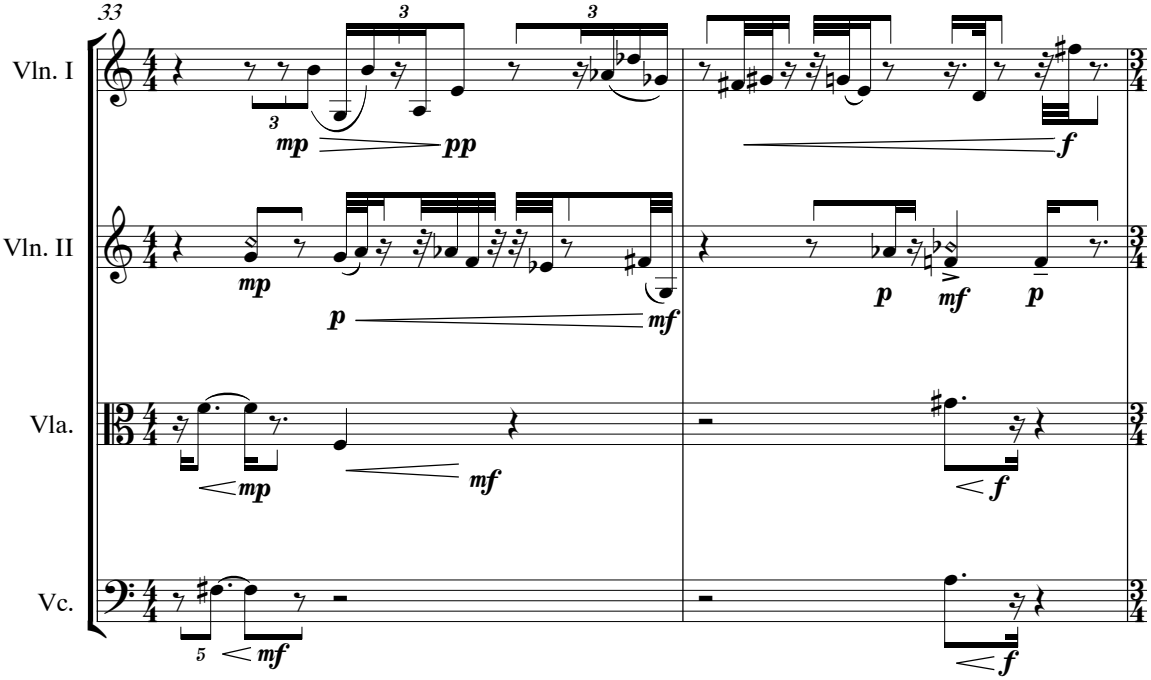
Vln. I
Vln. II
Vla.
Vc.
f
pp
p
pp
pp
f
p
mp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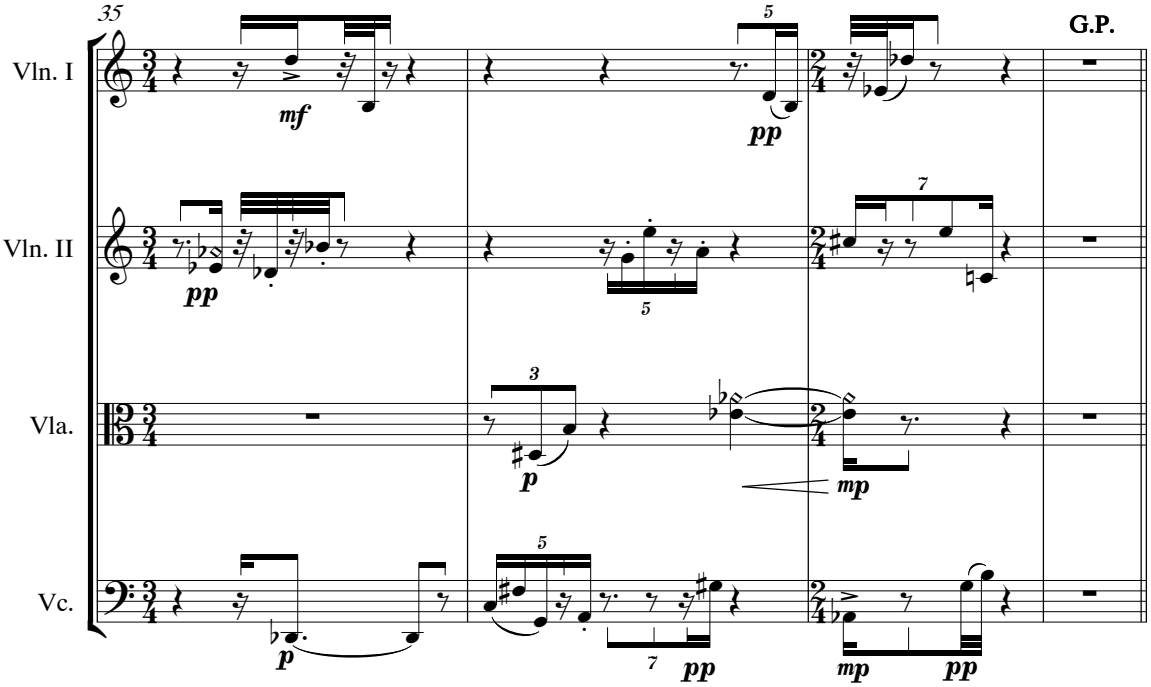
Vln. I
Vln. II
Vla.
Vc.
mp
pp
f
p
mf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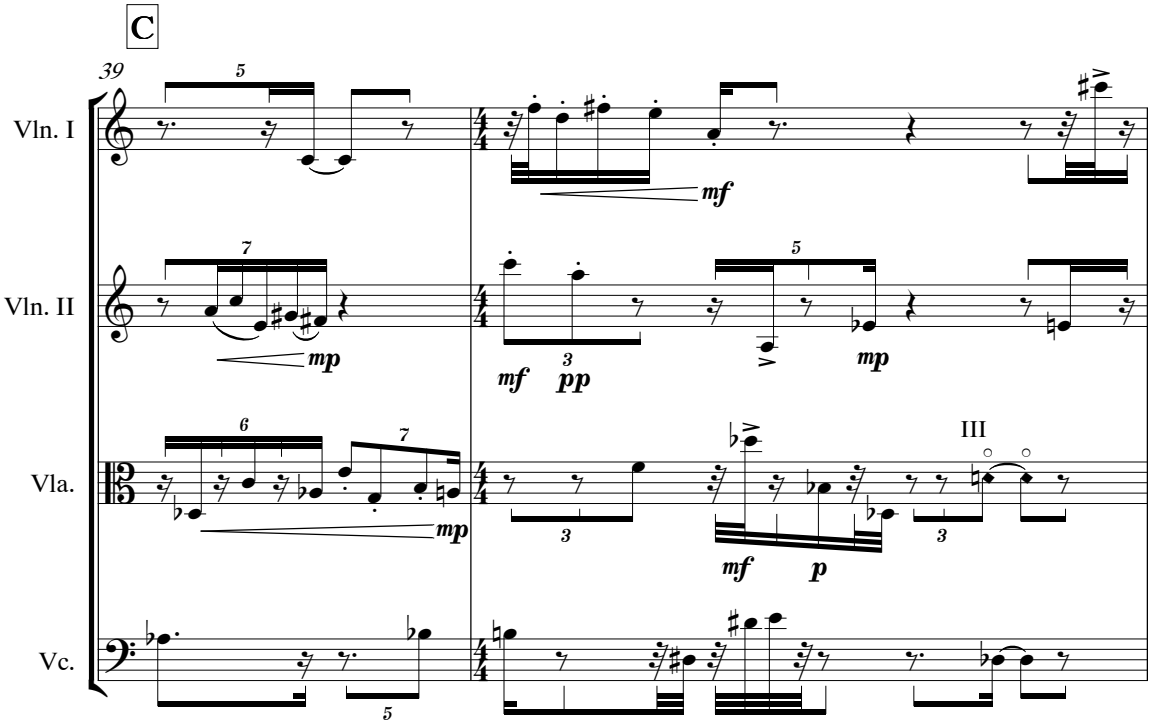
pp
p
mp


C
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Vln. I
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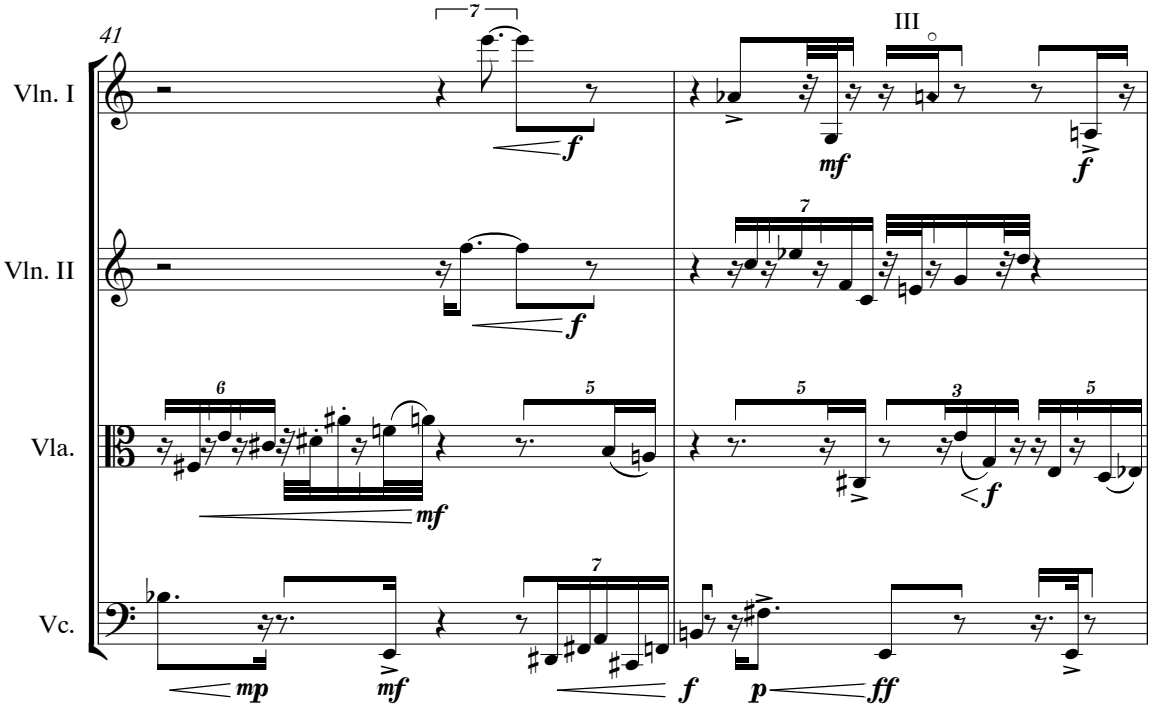
Vc.
III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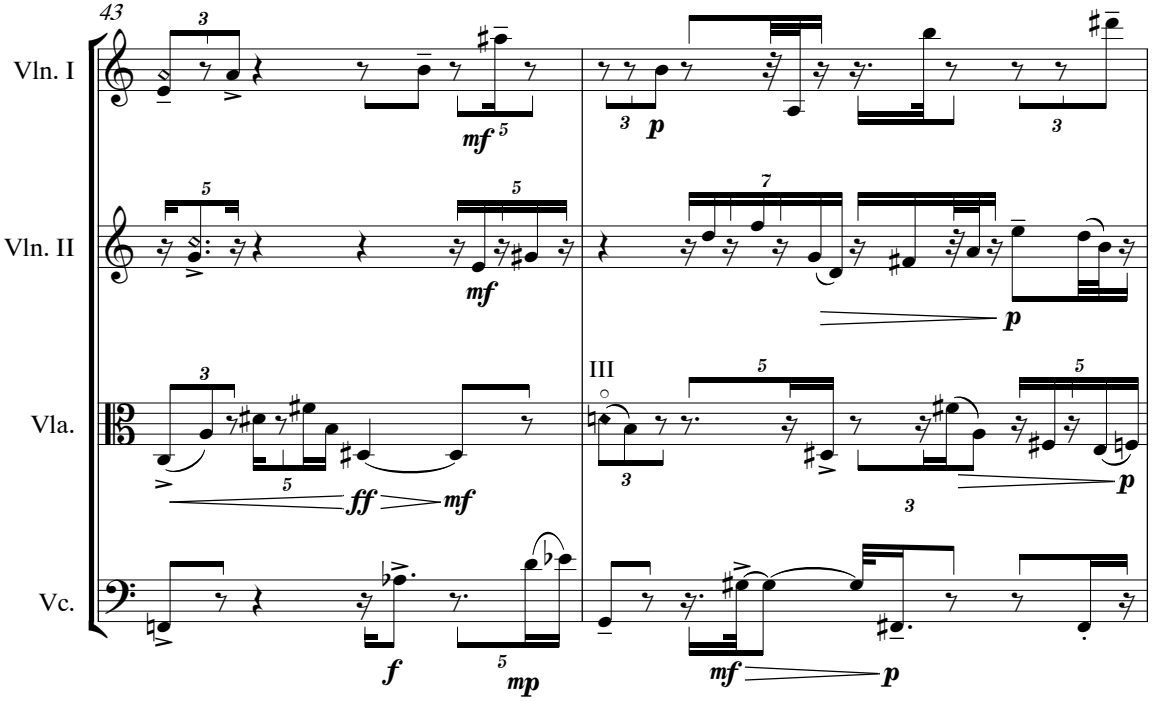
Vla.
Vc.
III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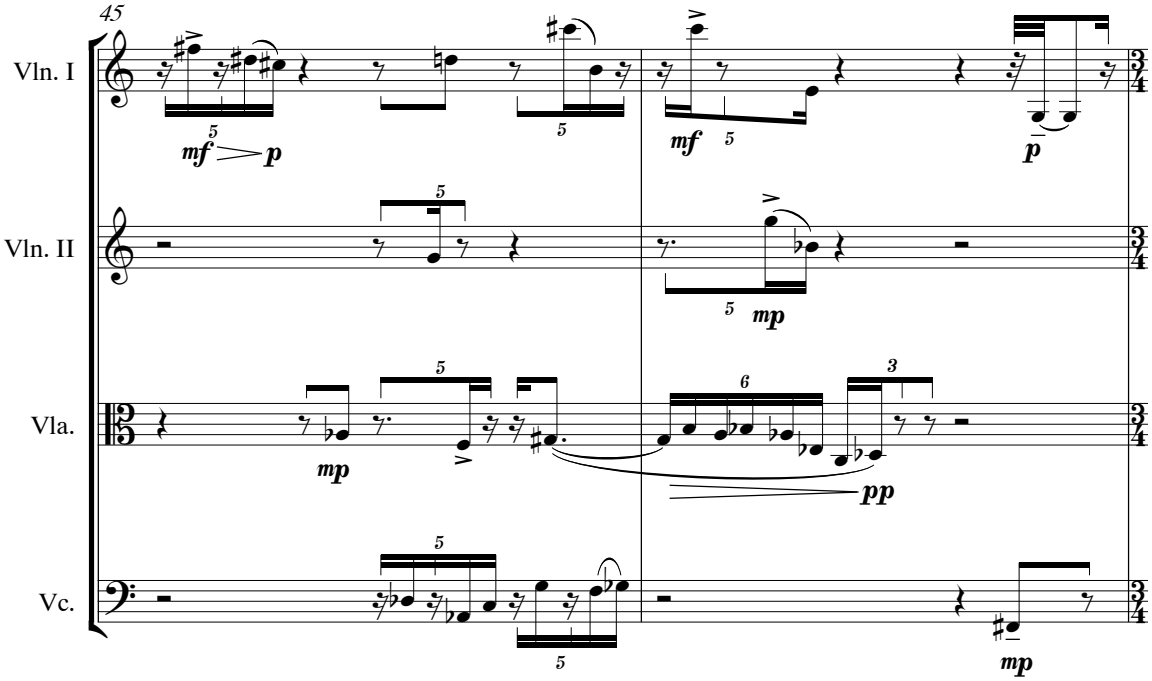
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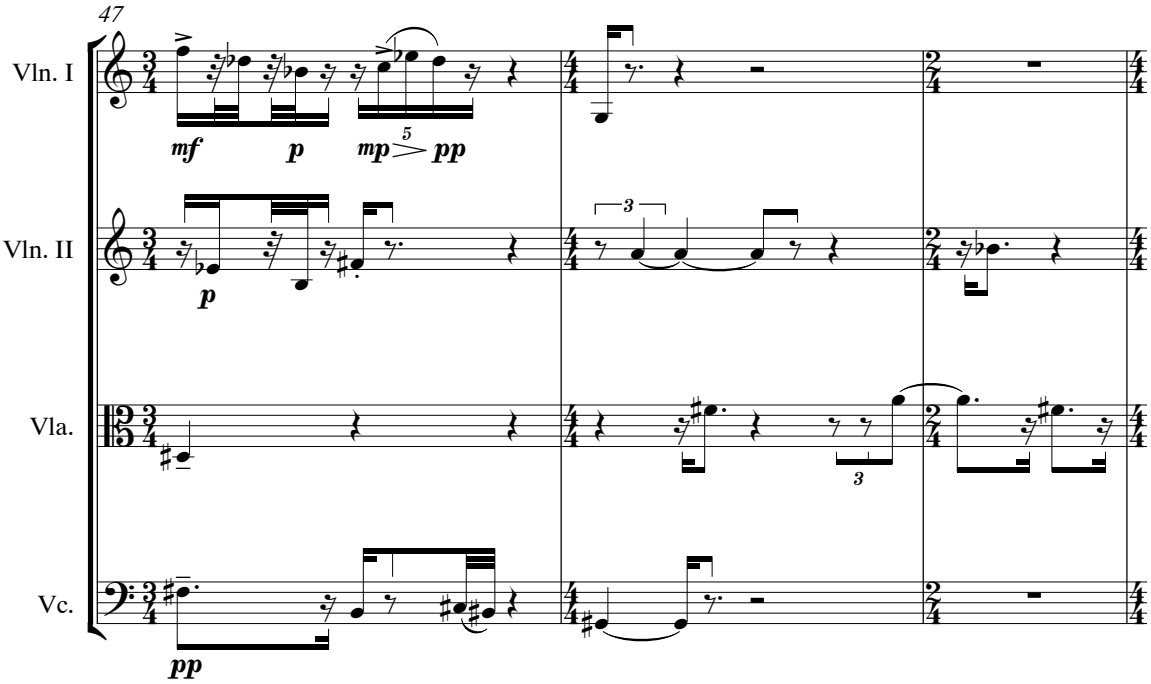
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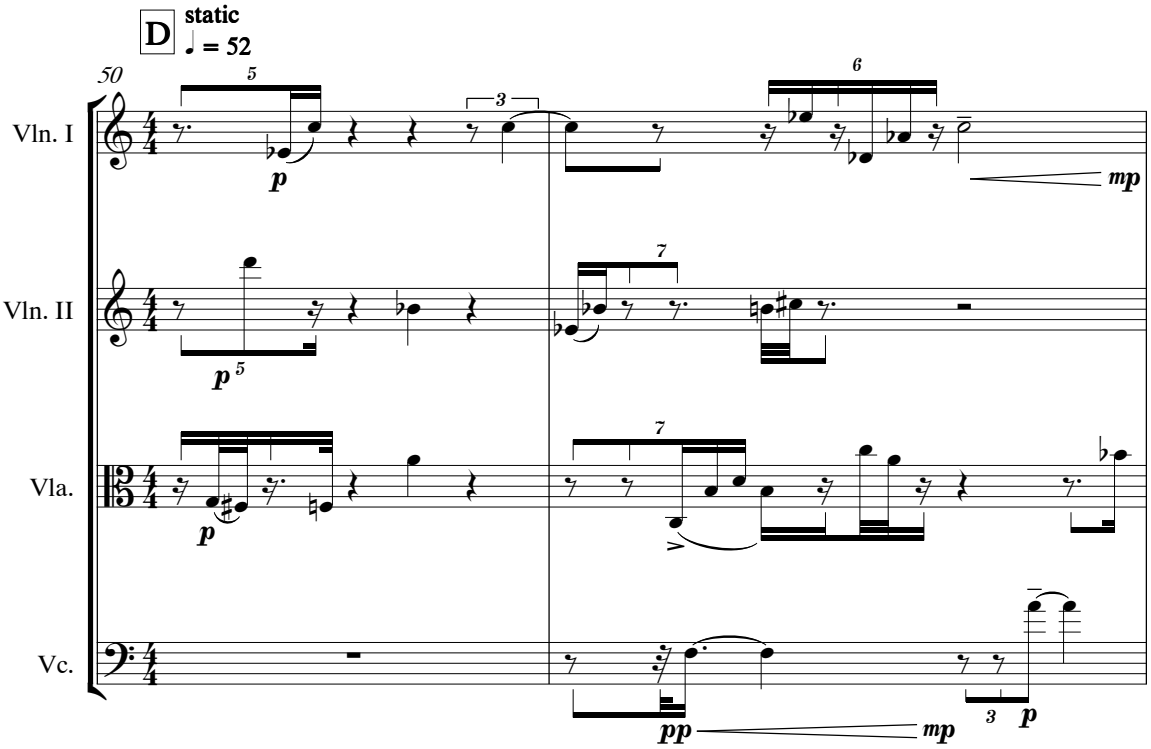
p
pp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♩ = 52
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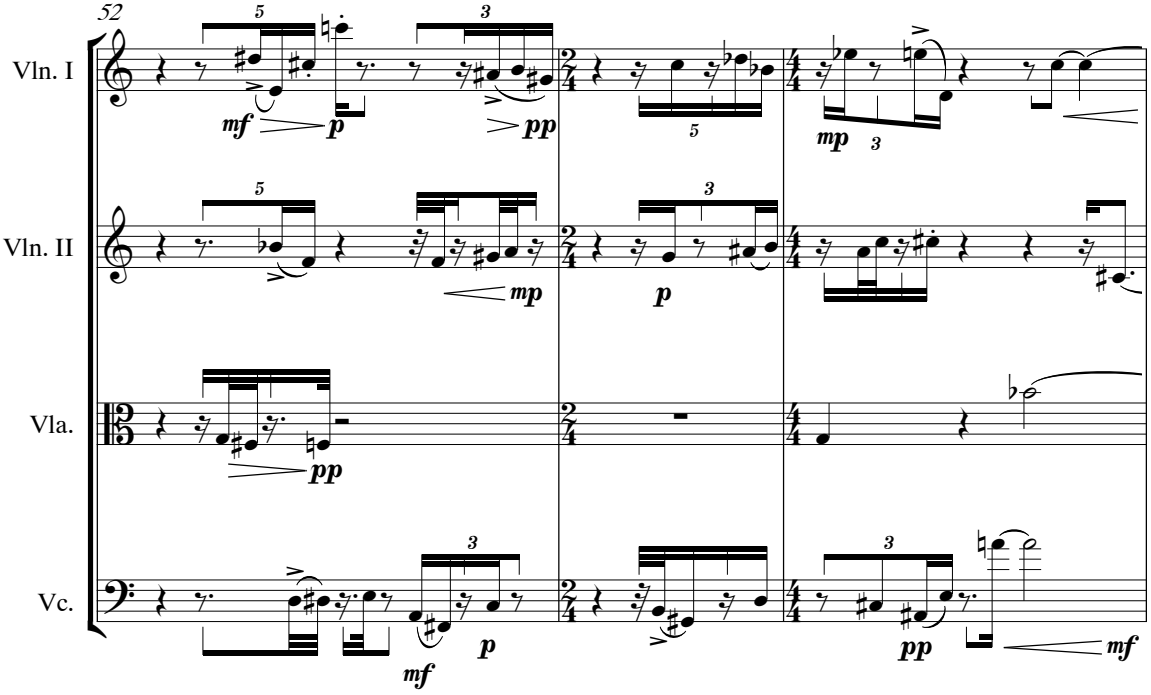
Vln. II
Vla.
Vc.
p
p
p
pp
mp
mp
p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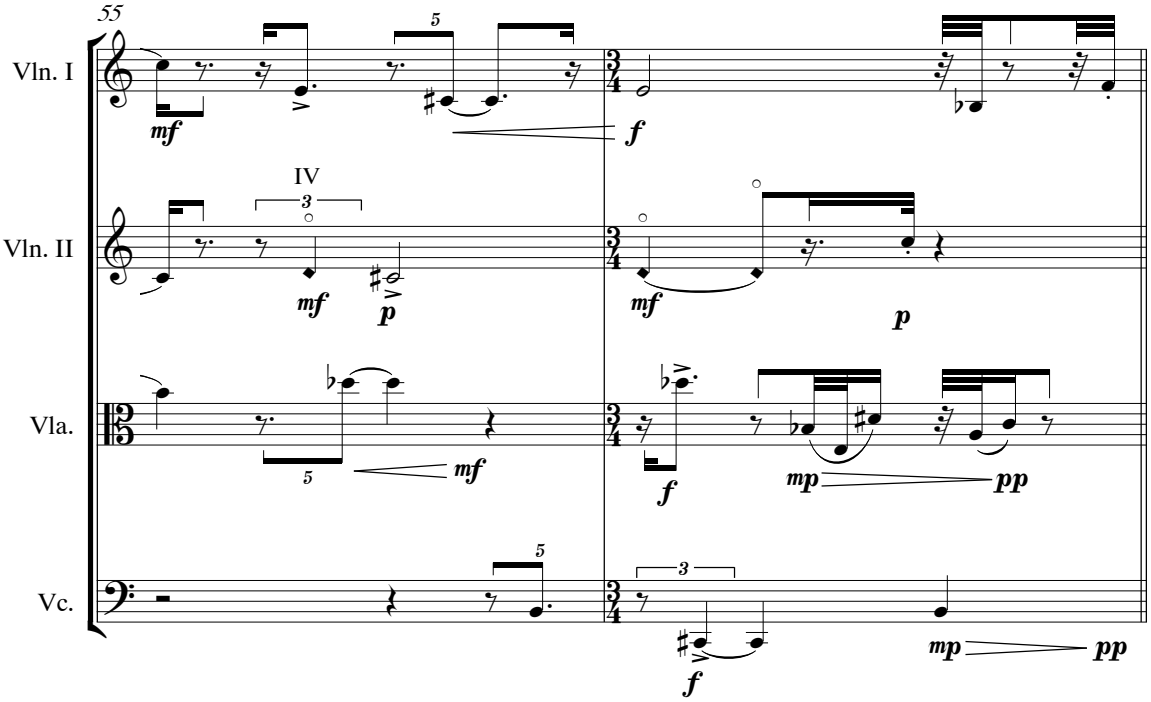
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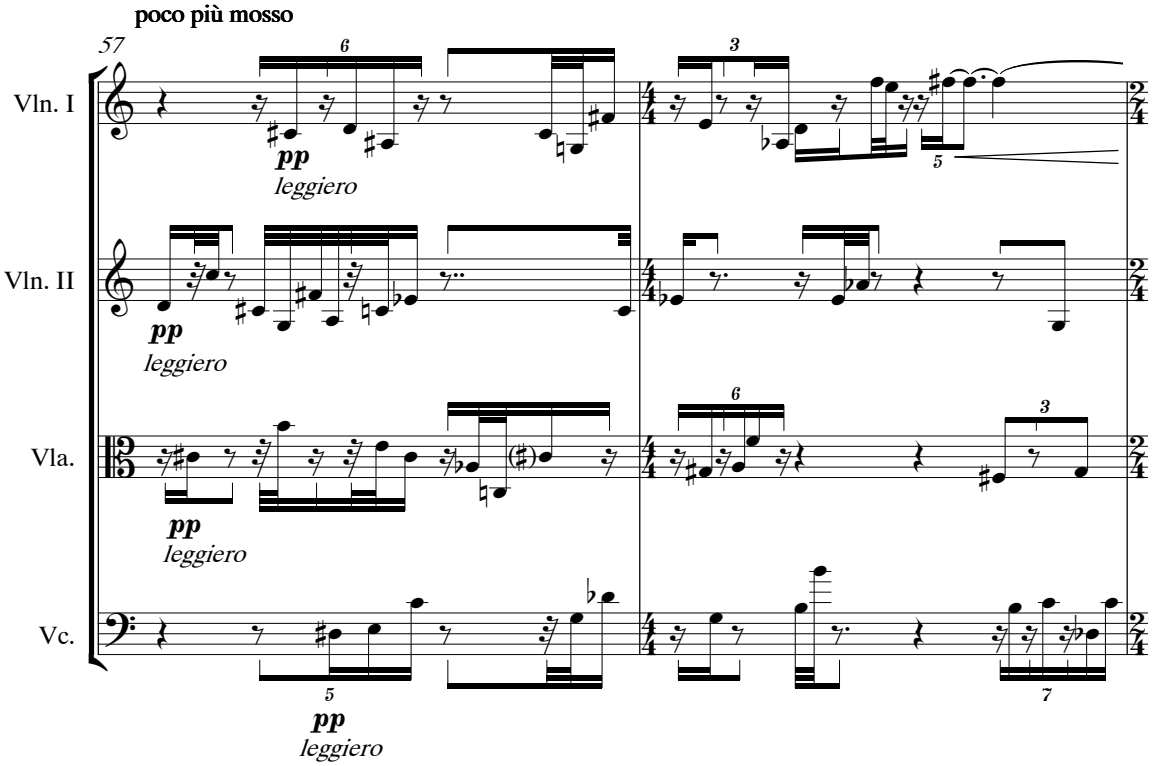
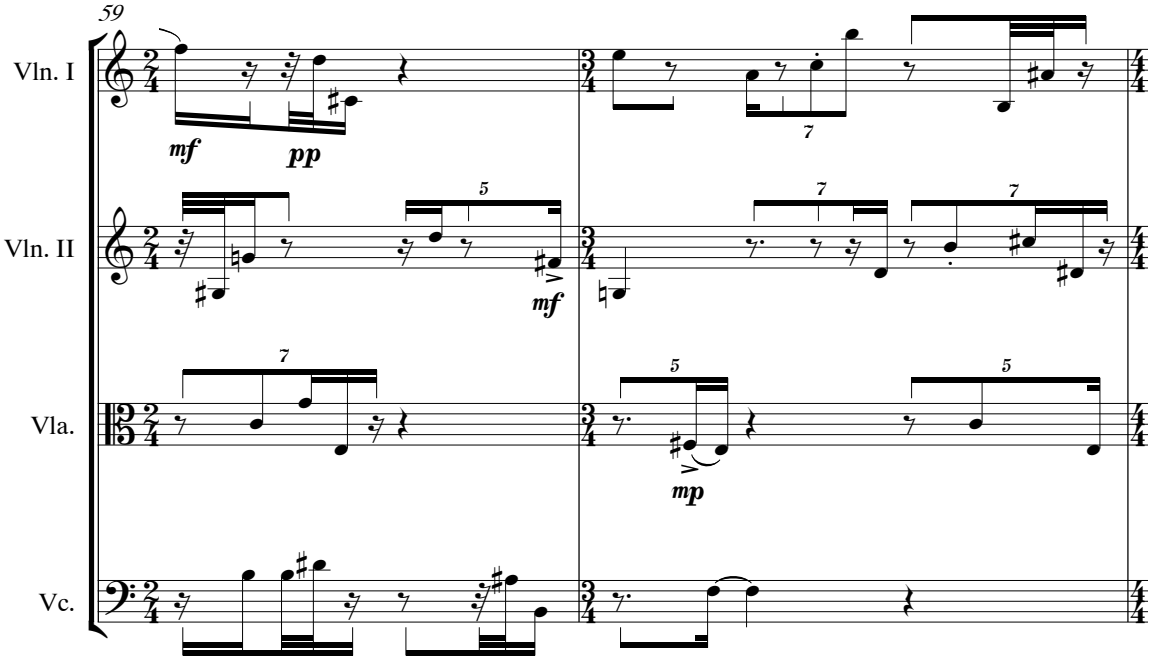
Vc.
IV


poco più mosso
57
Vln. I
Vln. II
Vla.
Vc.
pp
leggiero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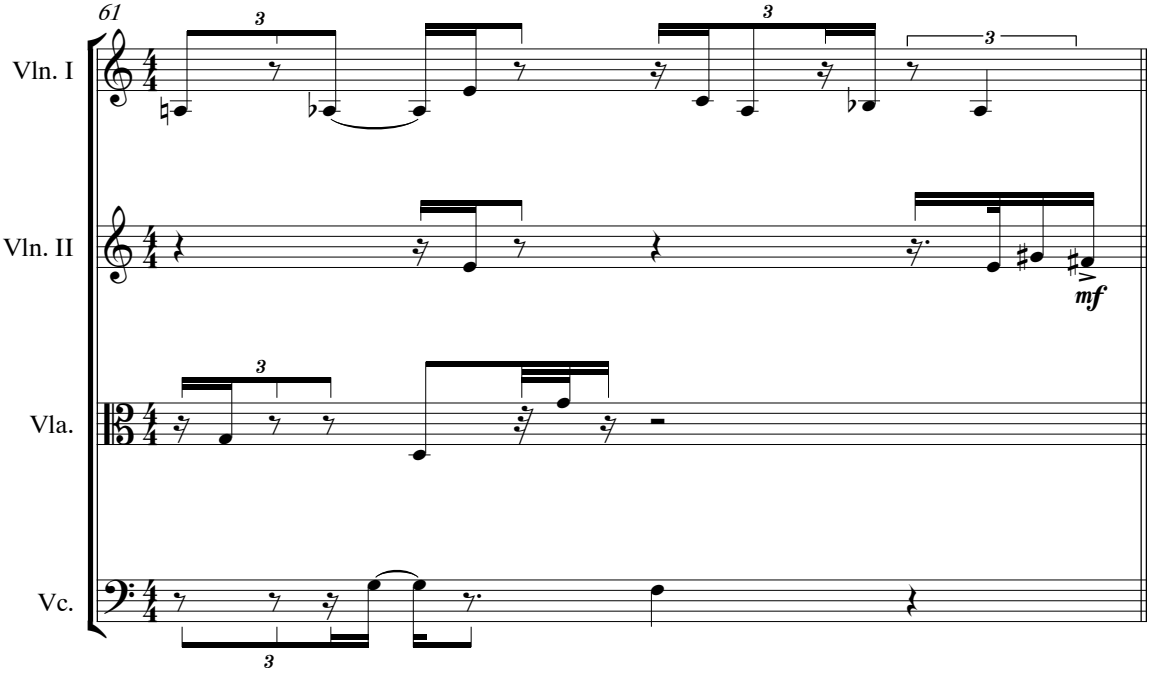
Vc.
mf
pp
mp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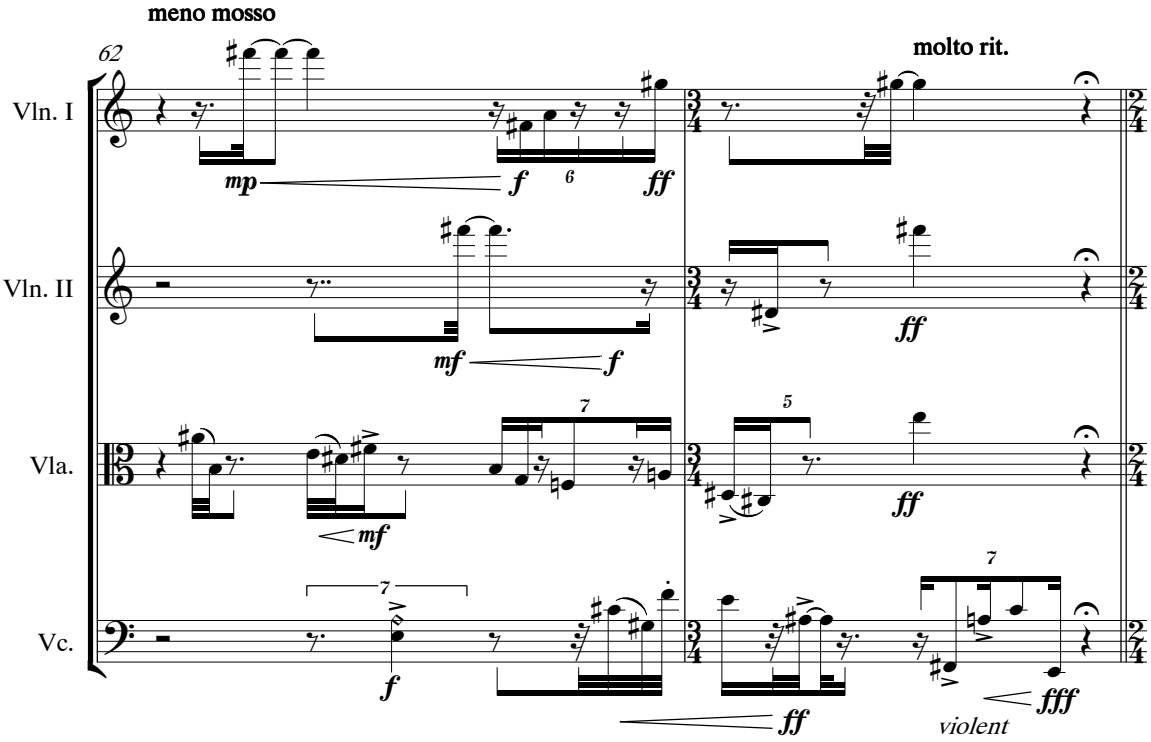
Vln. II
Vla.
Vc.
3
mf


meno mosso
molto rit.
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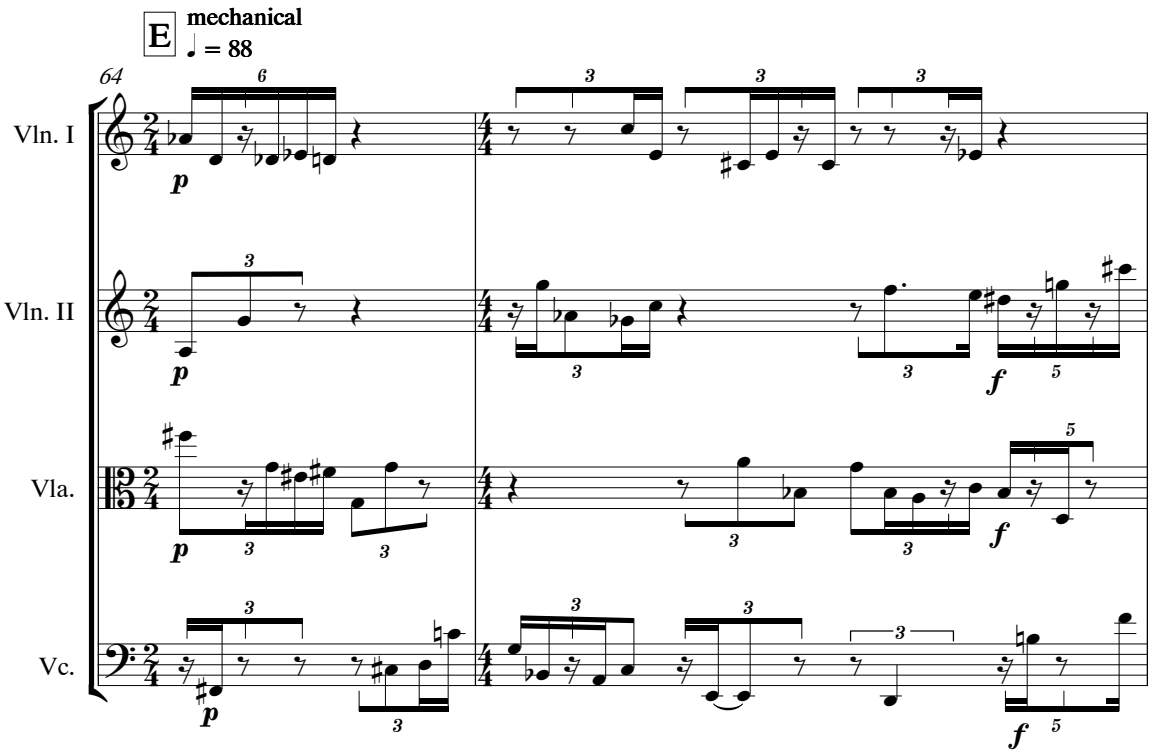
Vln. II
Vla.
Vc.
mp
f
6
ff
mf
7
5
violent
fff


E
mechanical
♩ = 88
64
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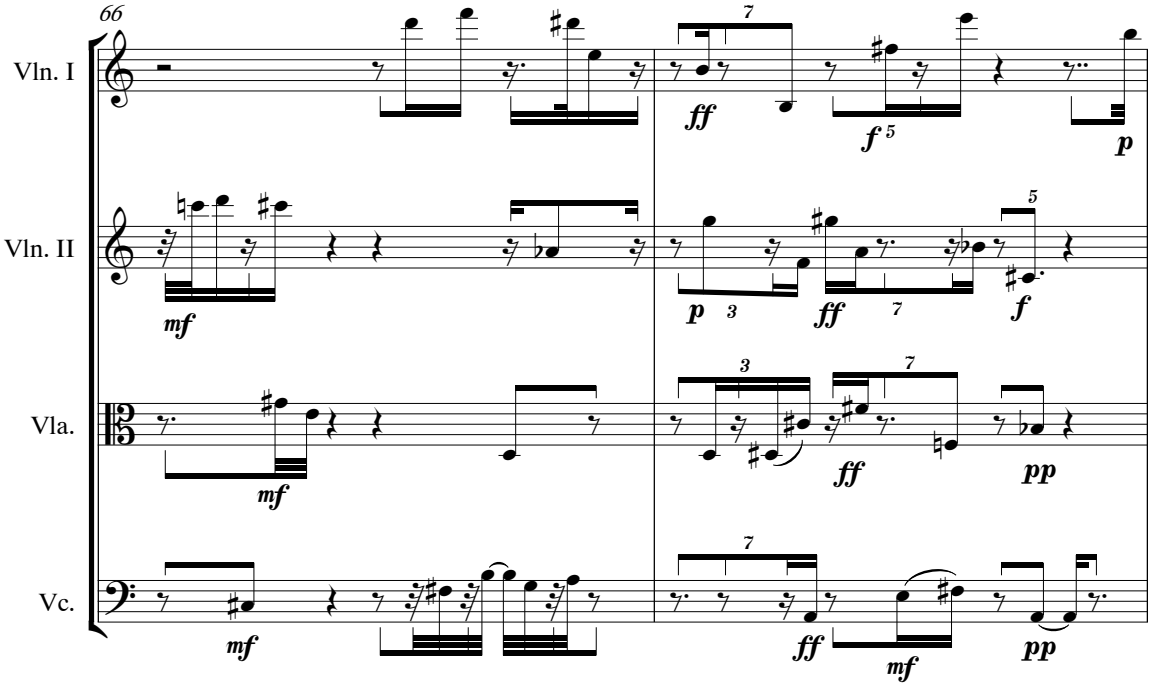
Vln. II
Vla.
Vc.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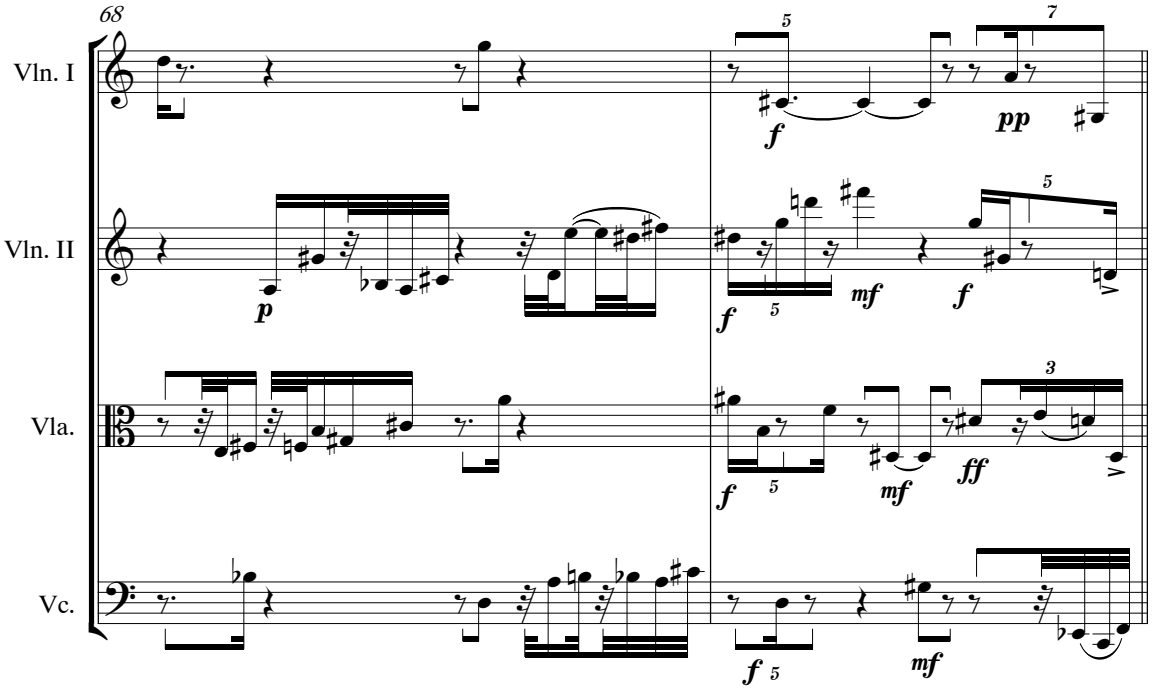
Vln. II
Vla.
Vc.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Vla.
Vc.
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pp
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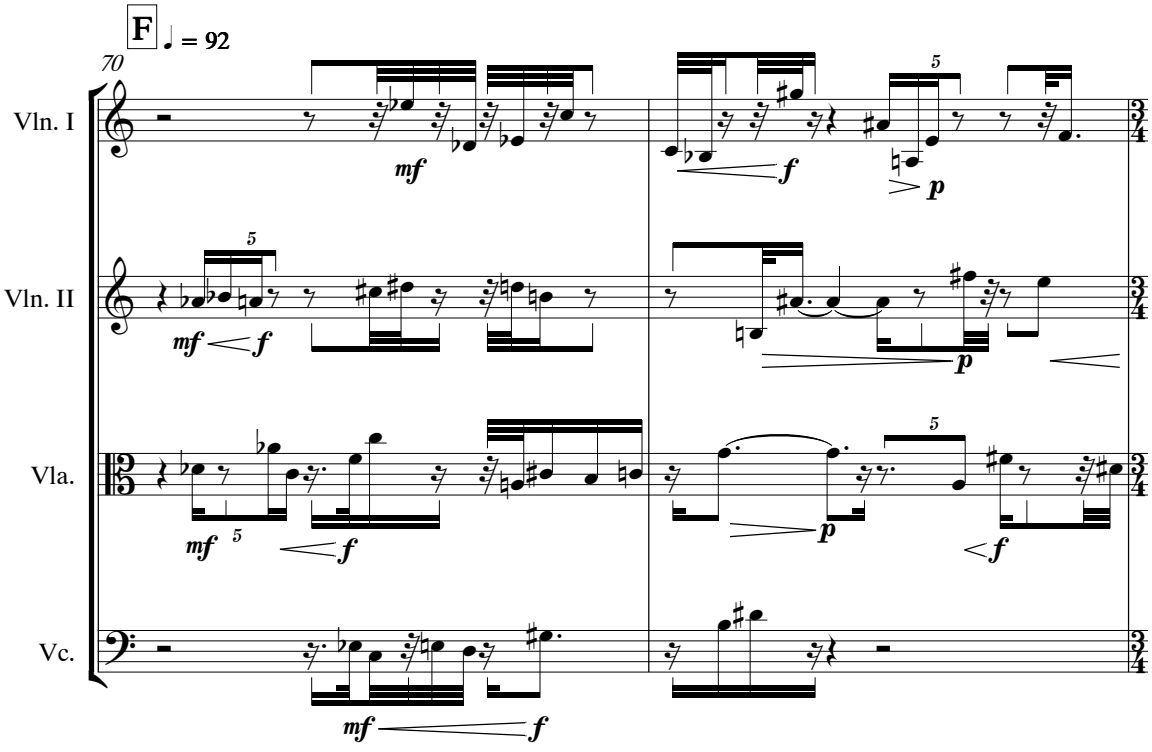
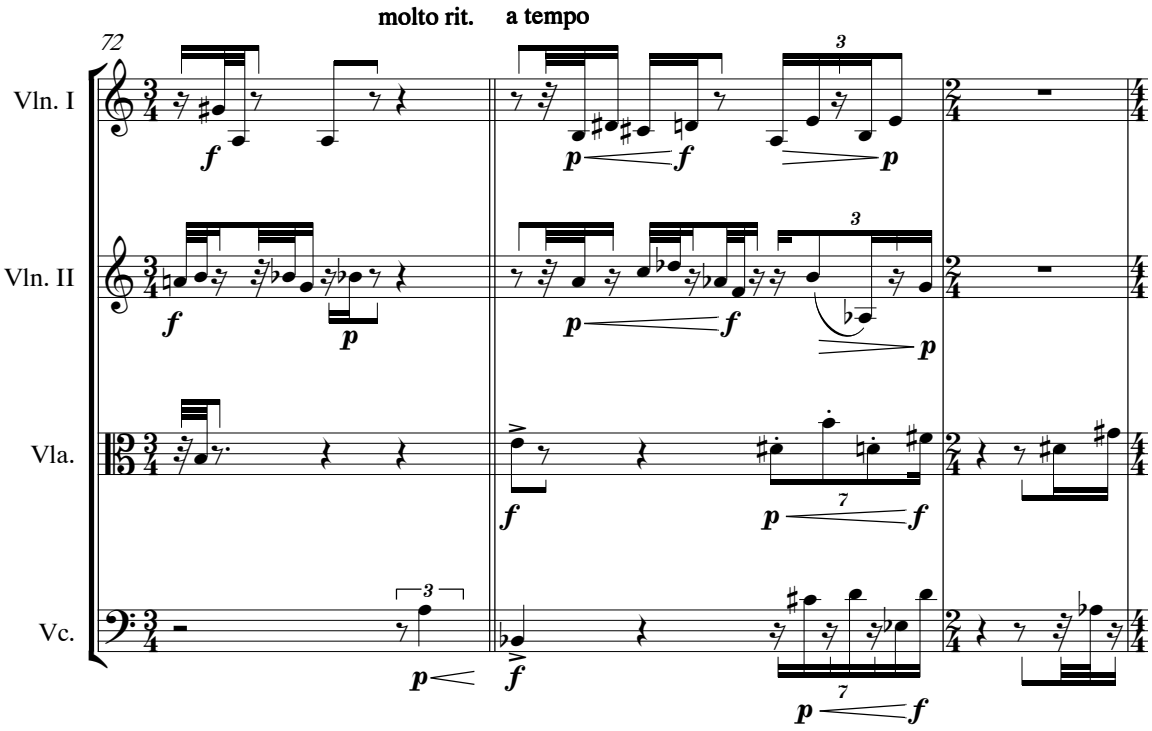
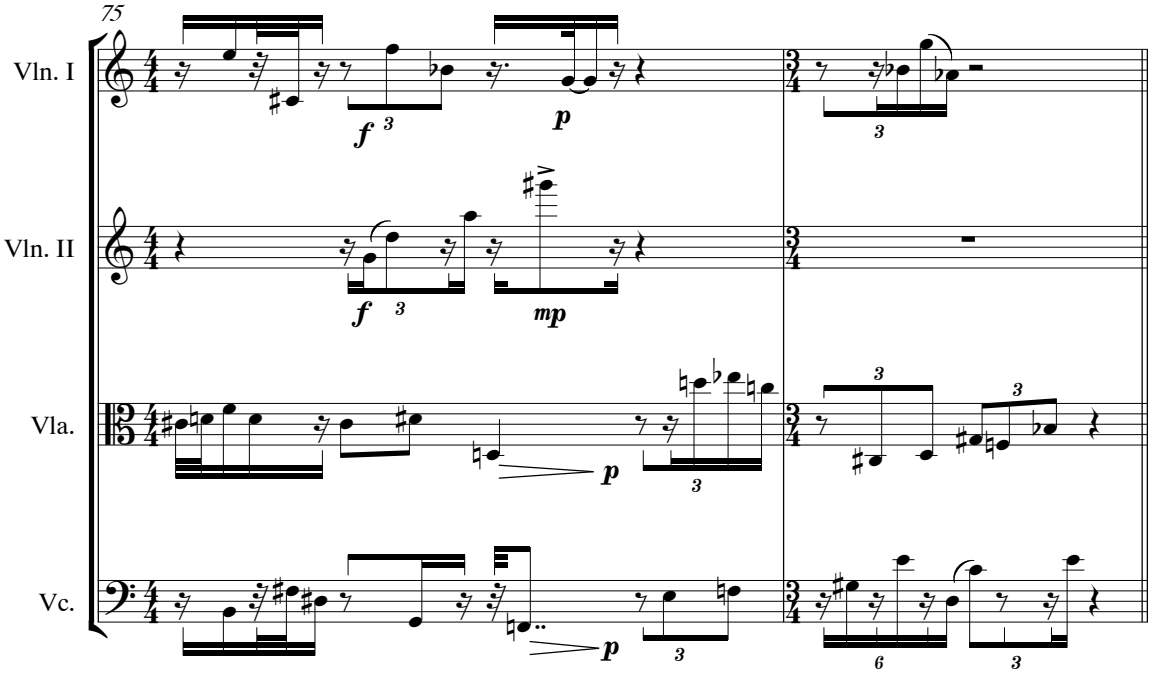
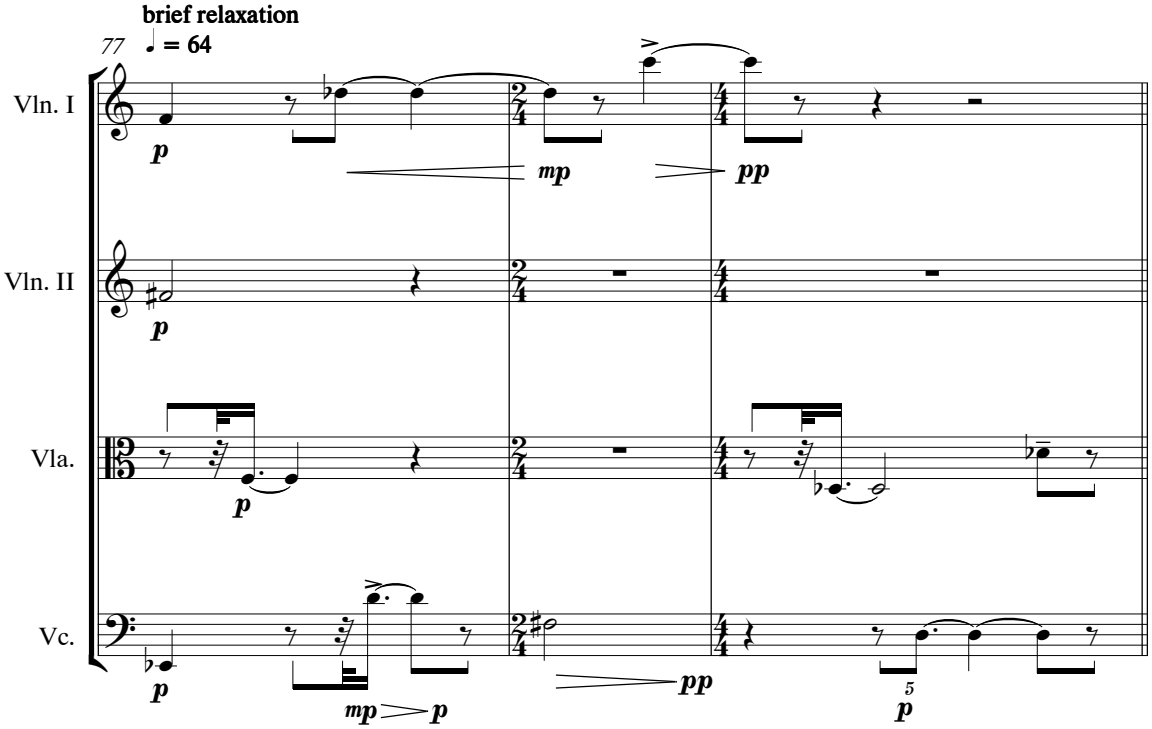
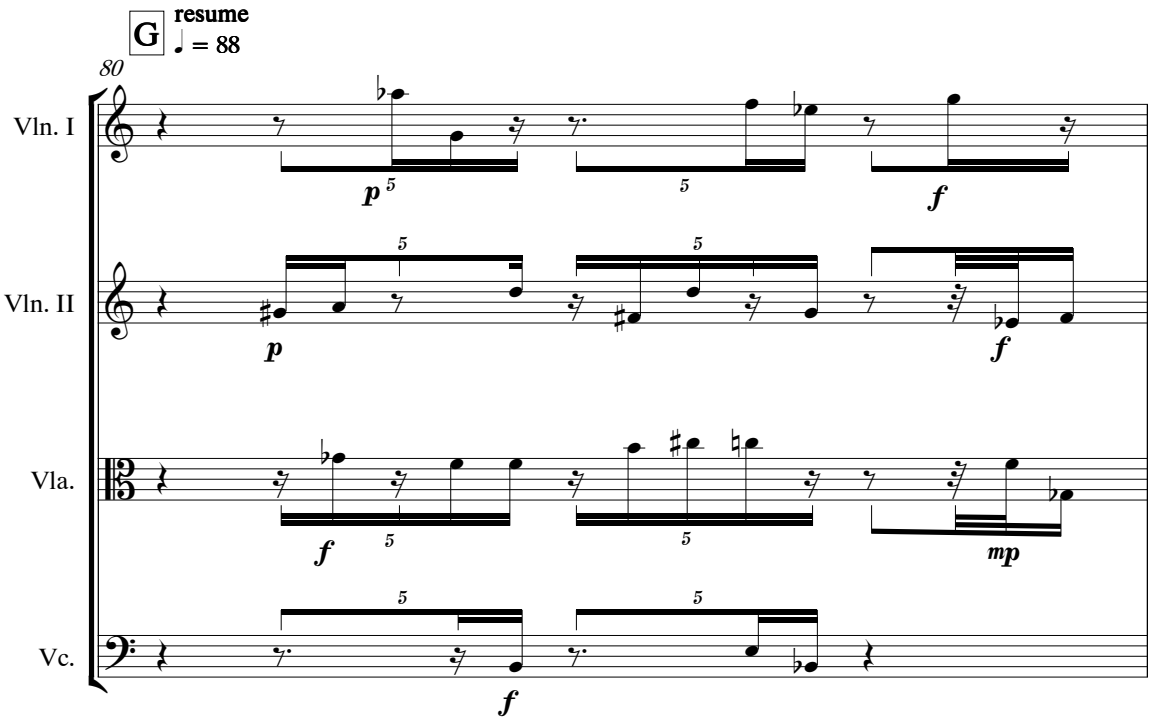
mf
f
ff

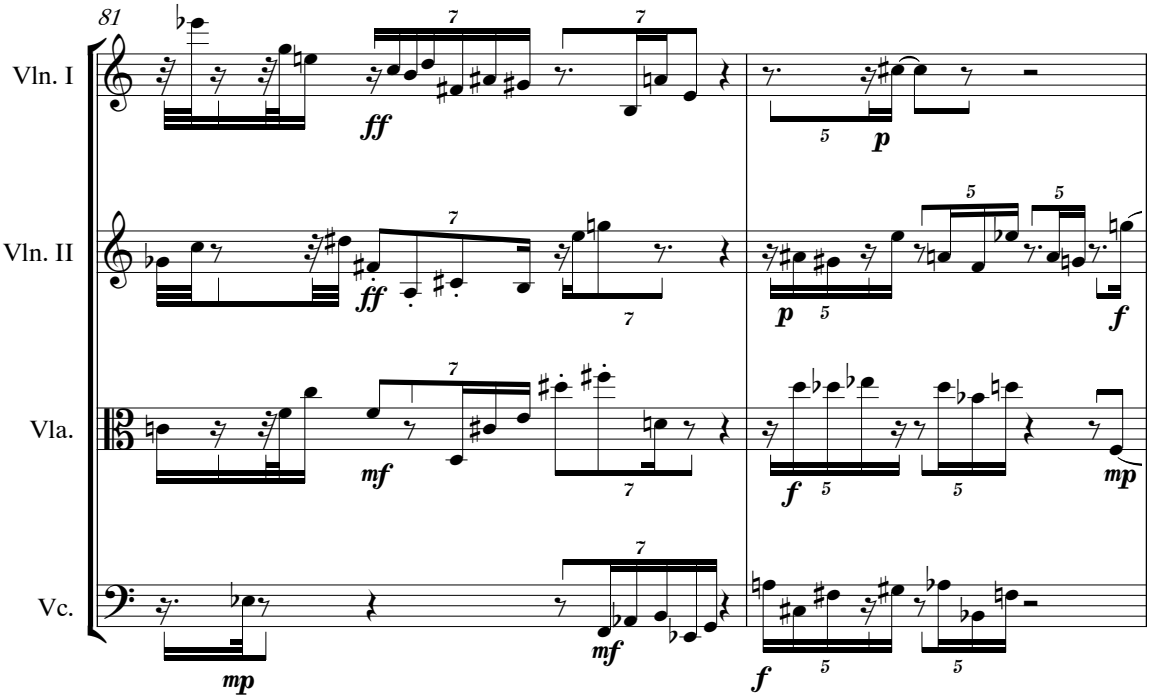

F
♩ = 92
70
Vln. I
Vln. II
Vla.
Vc.
mf
f
p

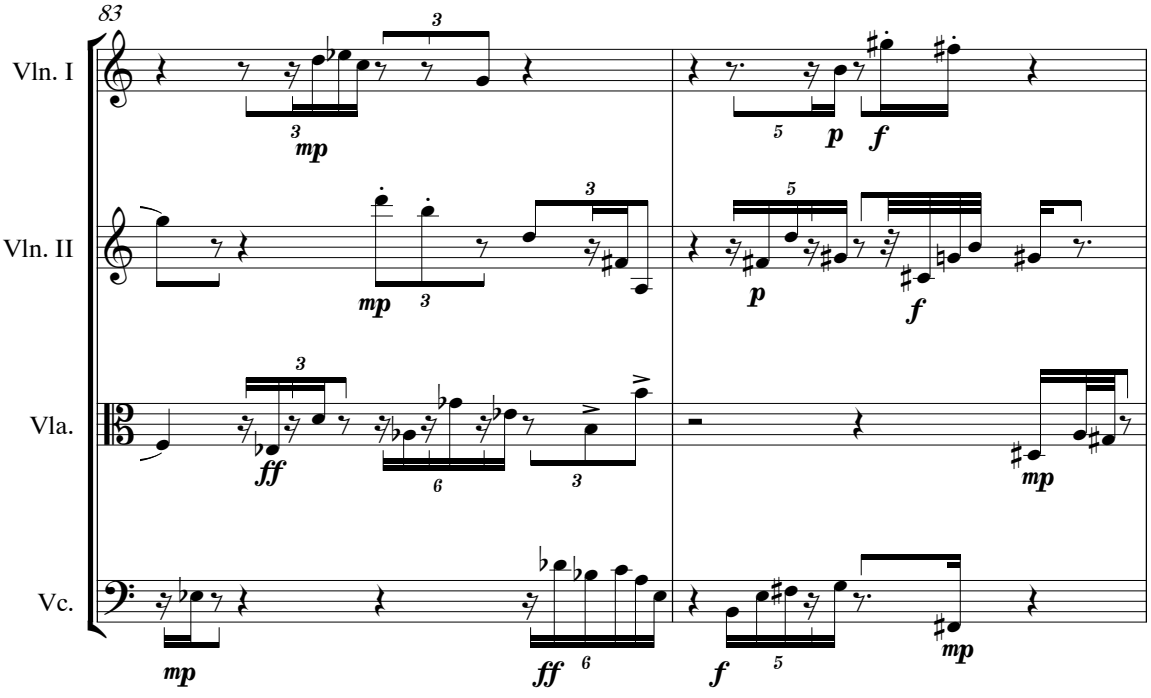

molto rit.
a tempo
72
Vln. I
Vln. II
Vla.
Vc.

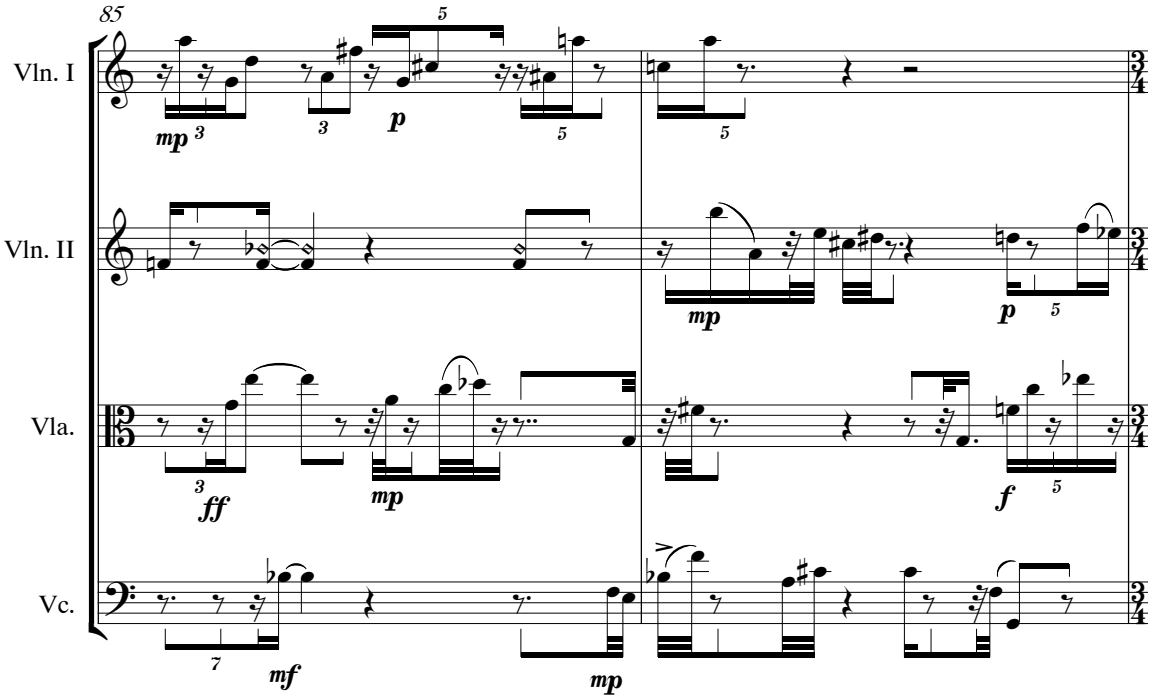

75
Vln. I
Vln. II
Vla.
Vc.

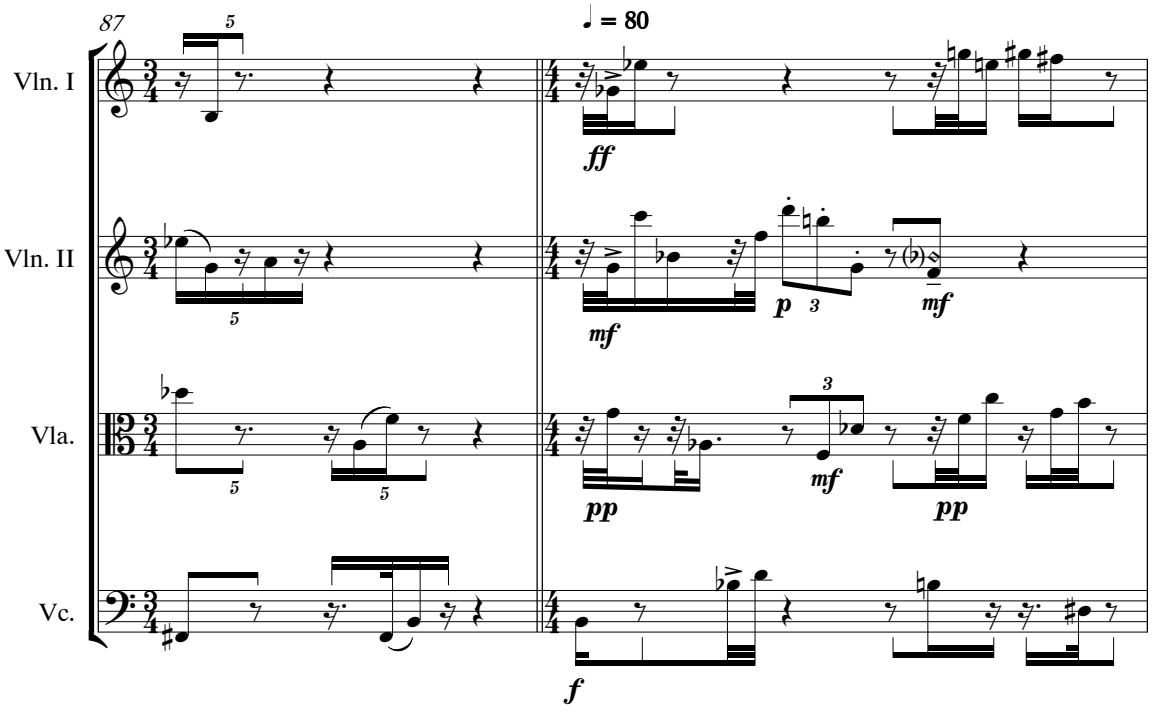

brief relaxation
77
♩ = 64
Vln. I
Vln. II
Vla.
Vc.
p
mp
pp
mp
p
pp
p

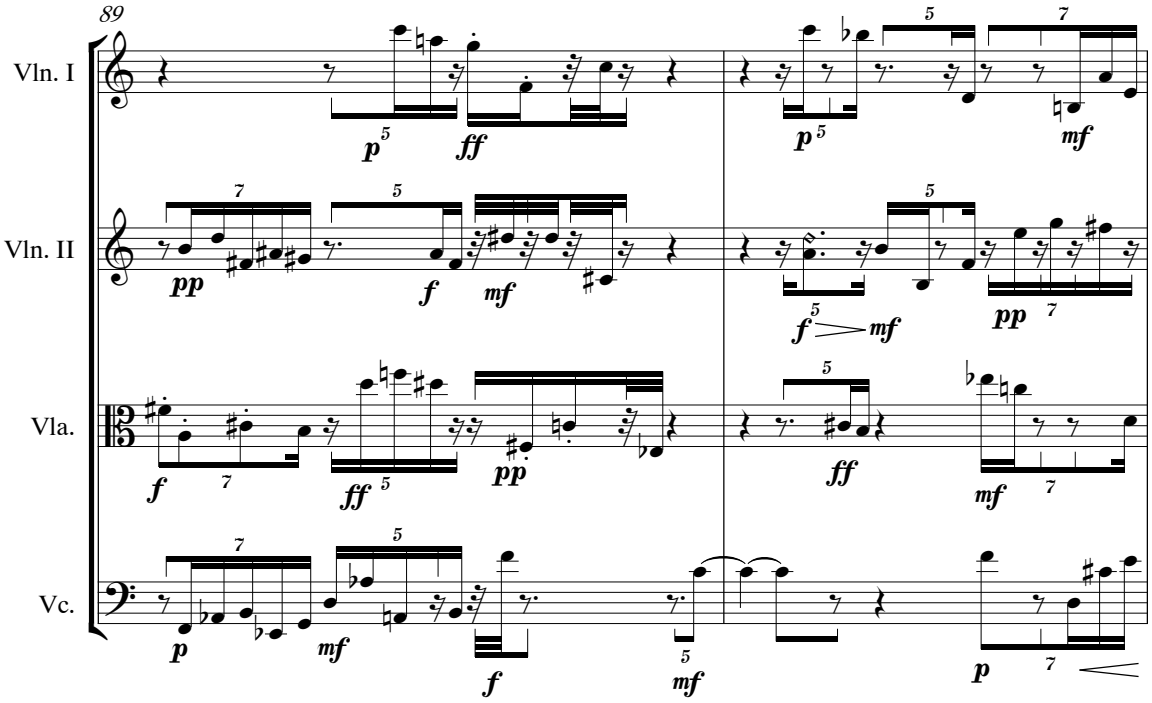

G
resume
♩ = 88
80
Vln. I
Vln. II
Vla.
Vc.
p
f
p
f
f
mp
f

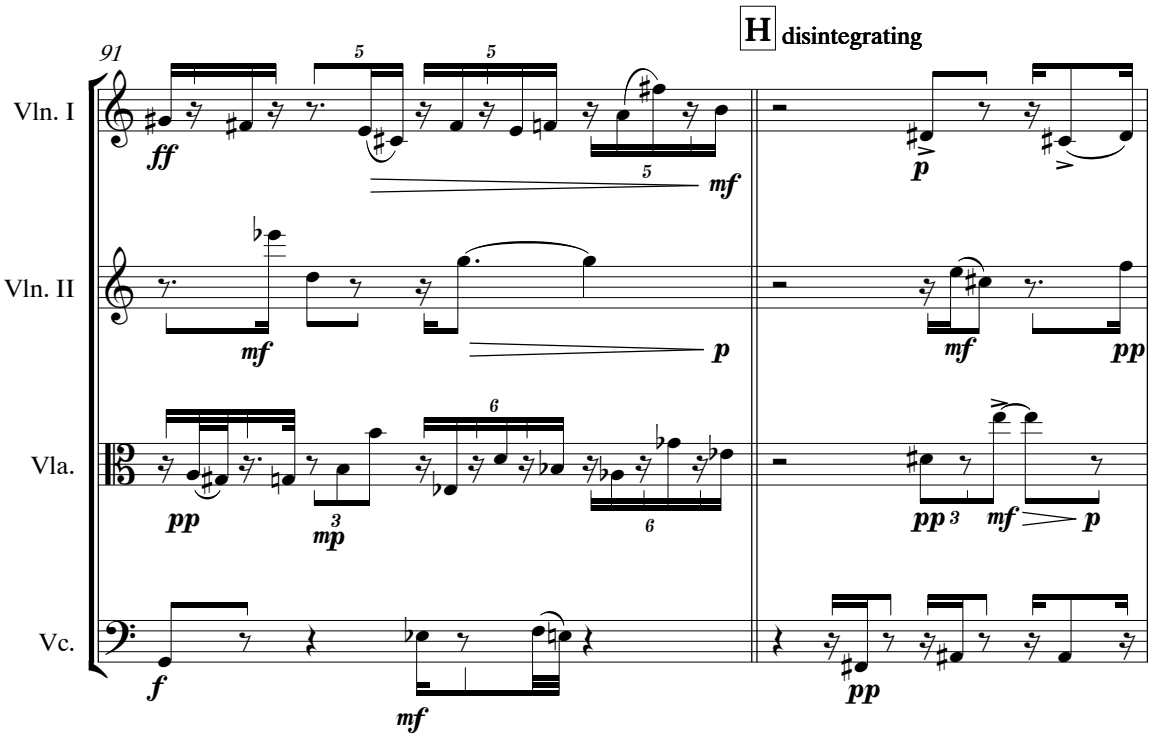

81
Vln. I
Vln. II
Vla.
Vc.
ff
p
mf
f
mp

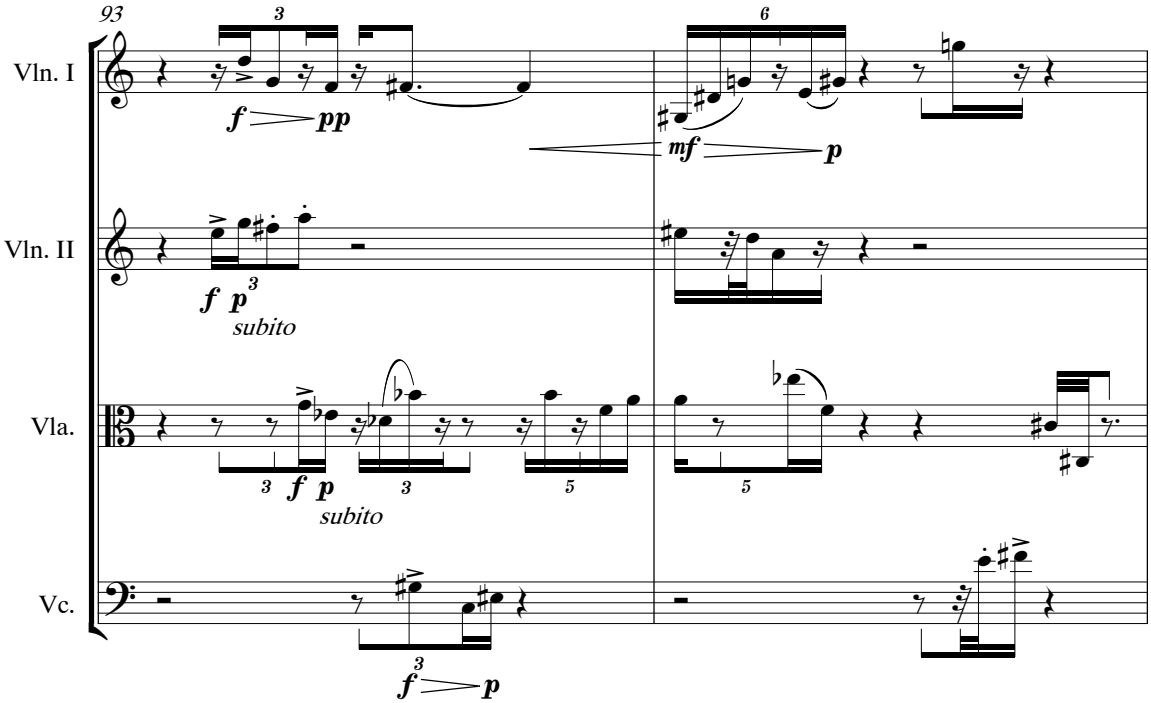

83
Vln. I
Vln. II
Vla.
Vc.
mp
ff
p
f

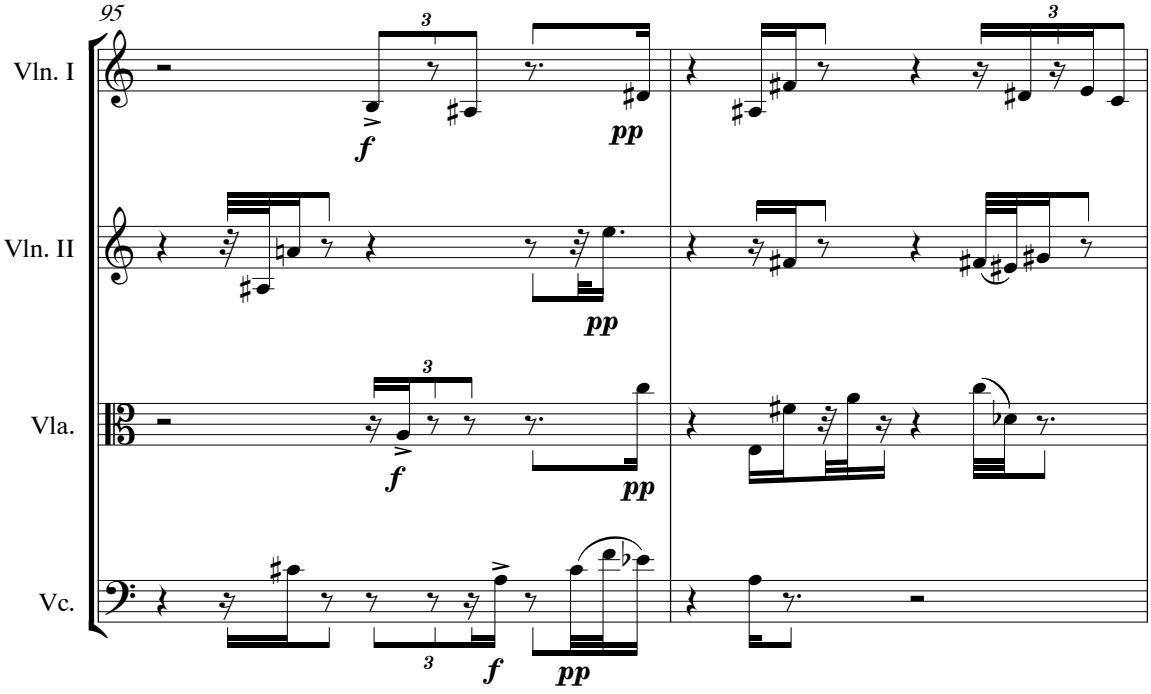

85
Vln. I
Vln. II
Vla.
Vc.
mp
p
mp
p
ff
mp
f
mf
mp

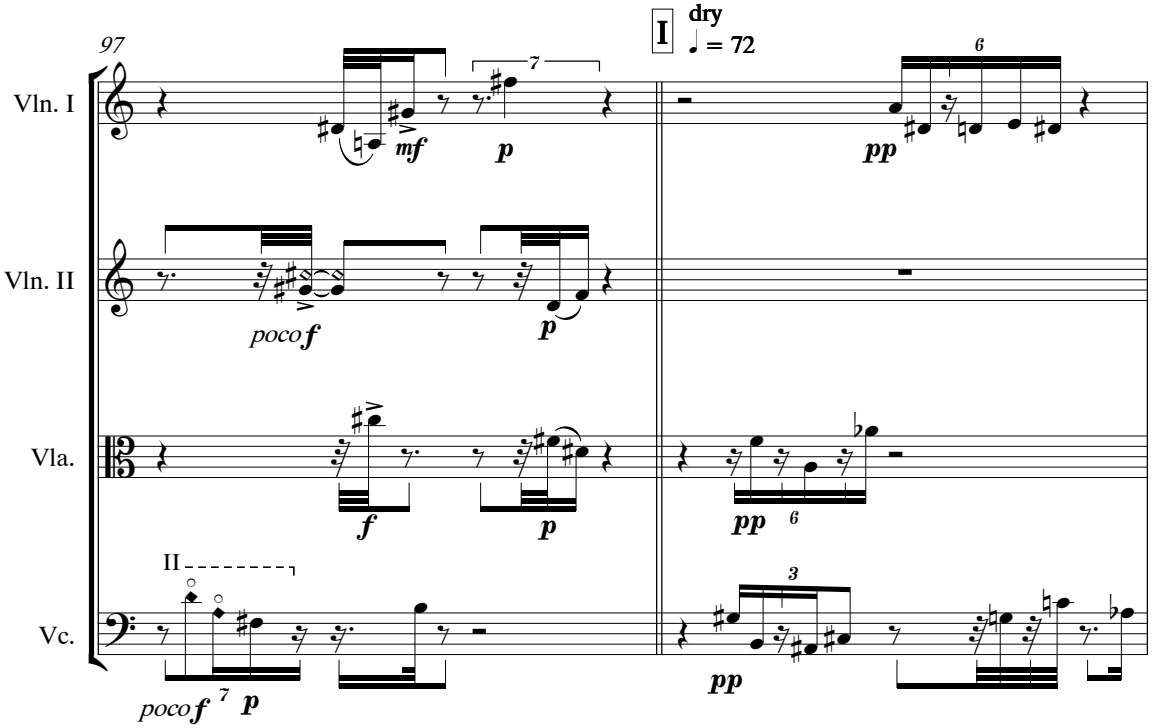

87
♩ = 80
Vln. I
Vln. II
Vla.
Vc.
ff
mf
p
mf
pp
mf
pp
f

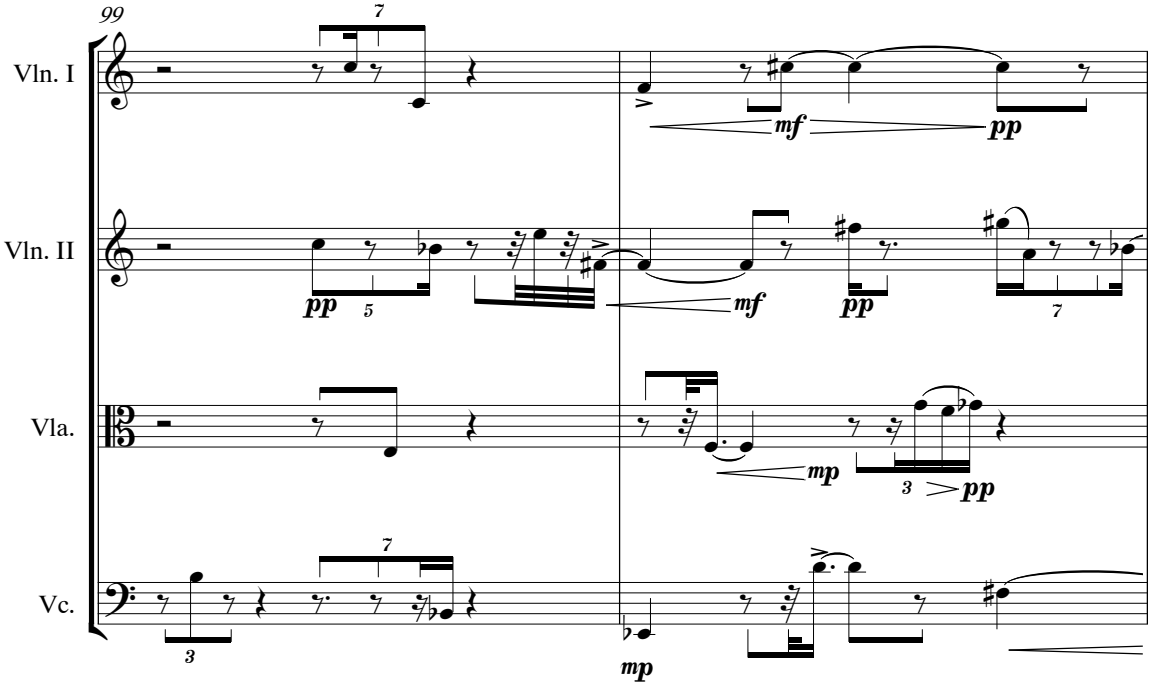

89
Vln. I
Vln. II
Vla.
Vc.

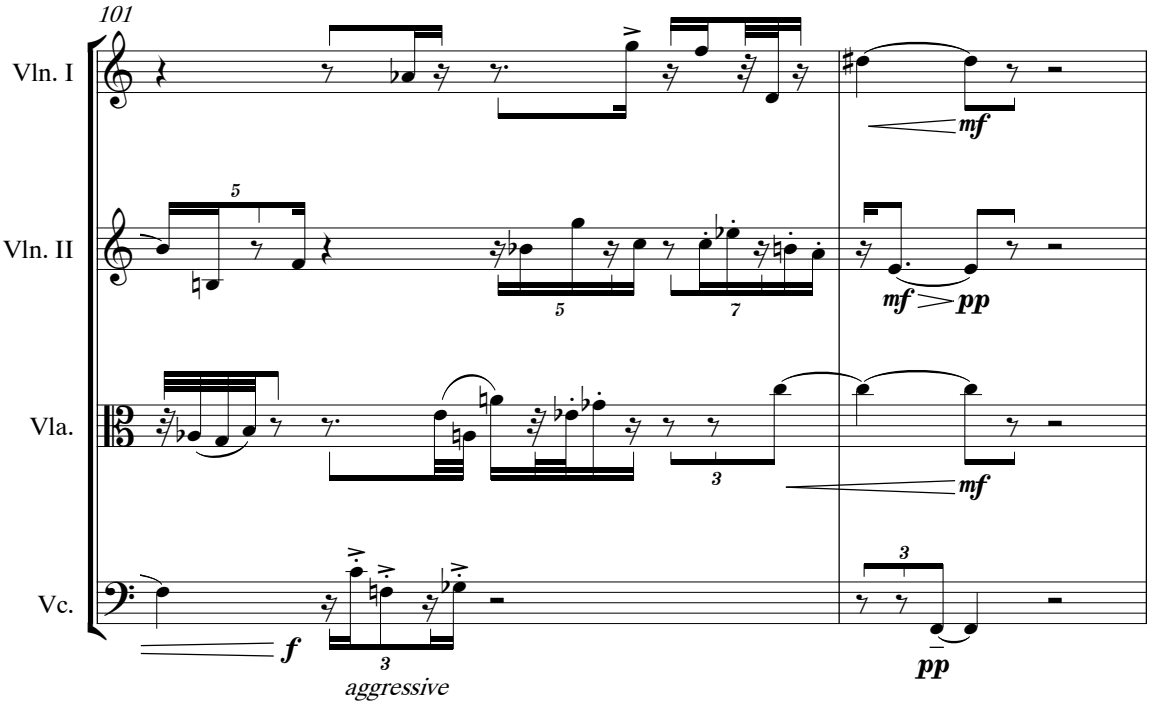

H disintegrating
91
Vln. I
Vln. II
Vla.
Vc.

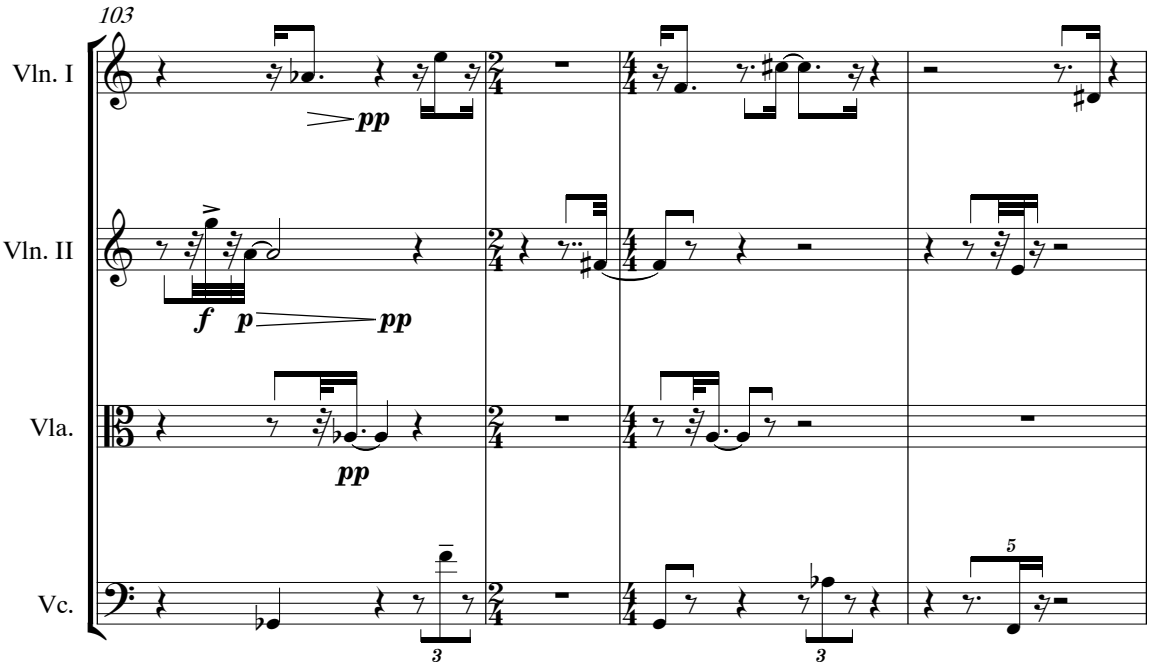

93
Vln. I
Vln. II
Vla.
Vc.
f
pp
mf
p
subito

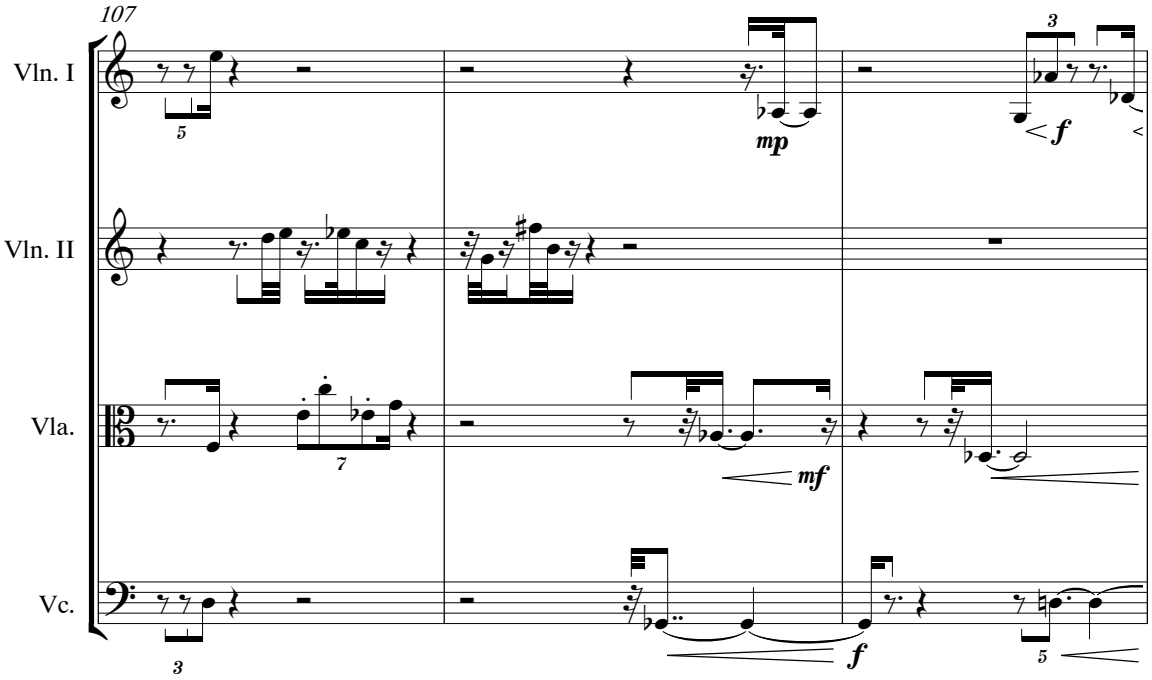

95
Vln. I
Vln. II
Vla.
Vc.
f
pp

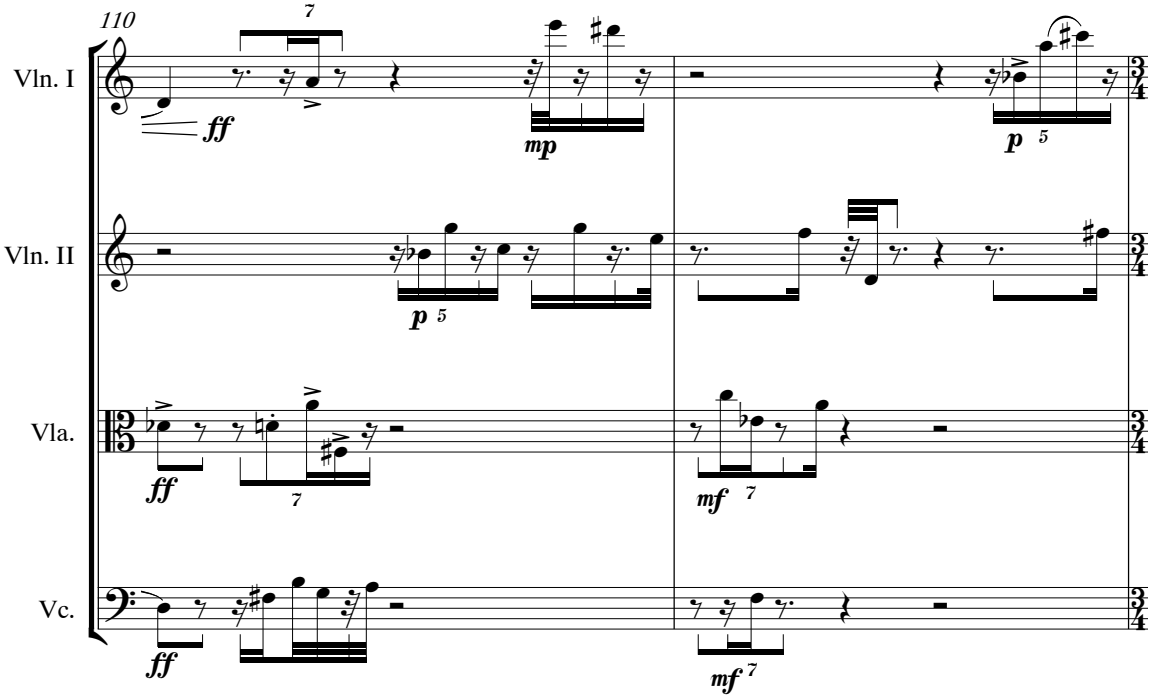

97
I
dry
♩ = 72
Vln. I
Vln. II
Vla.
Vc.
II
poco f
p
f
pp
mf

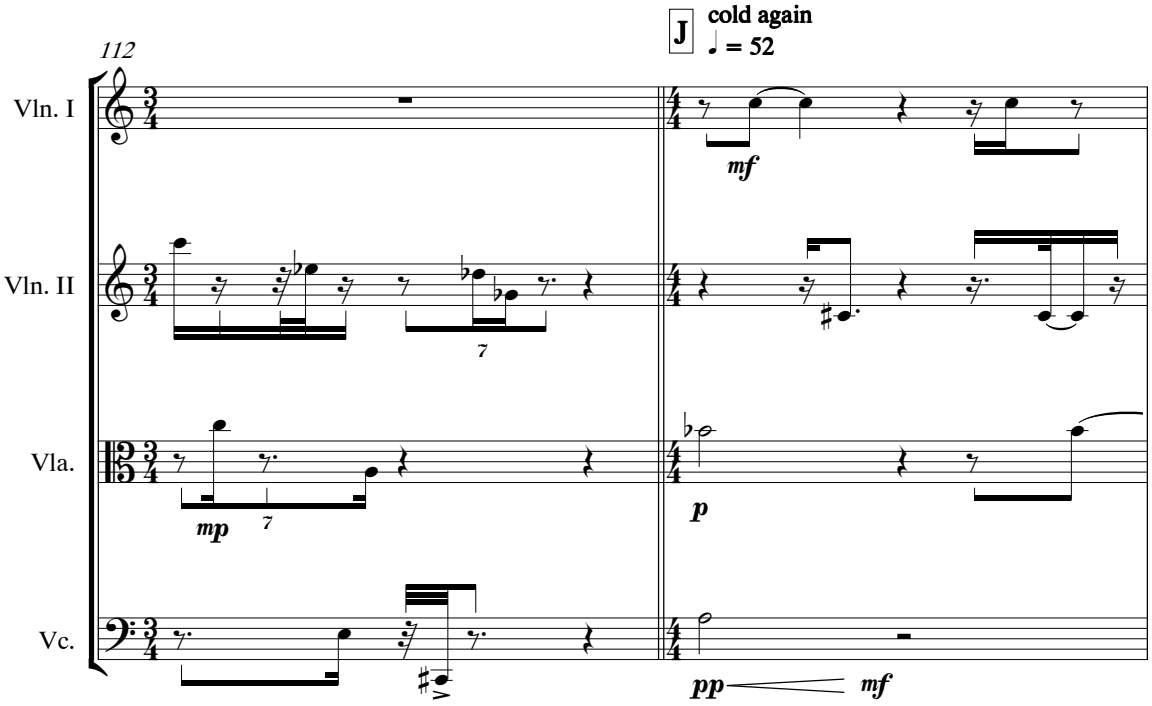

99
Vln. I
Vln. II
Vla.
Vc.
mf
pp
mp

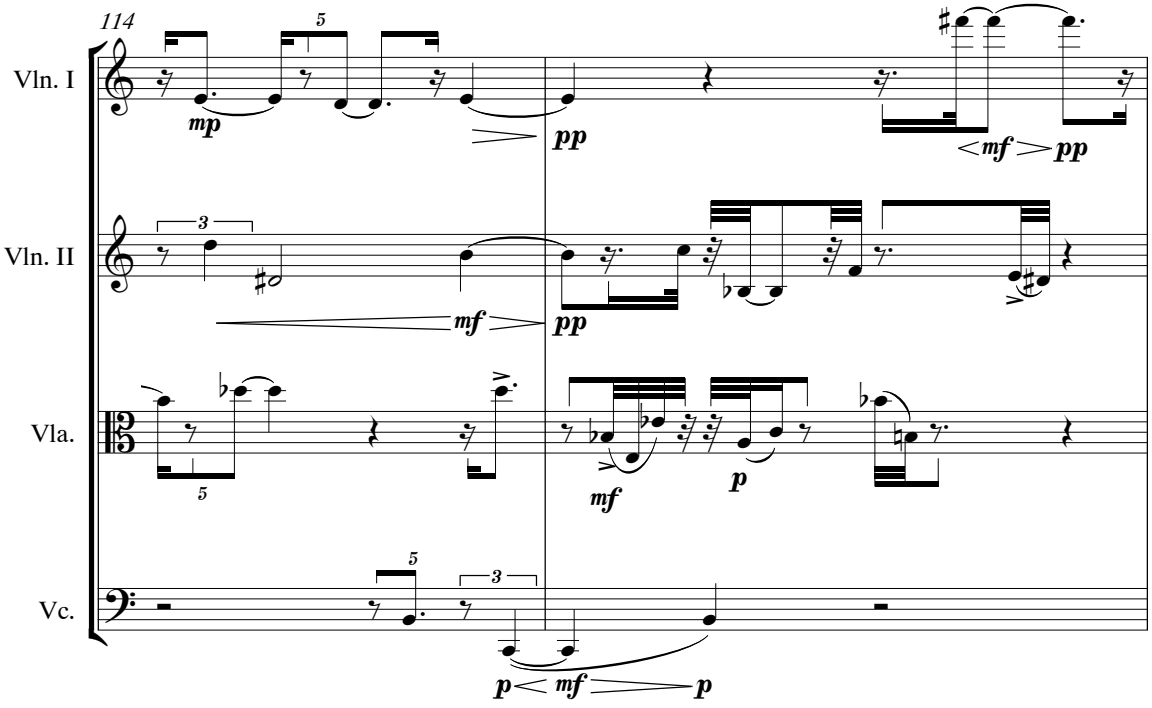

101
Vln. I
Vln. II
Vla.
Vc.
mf
mf
pp
mf
f
aggressive
pp

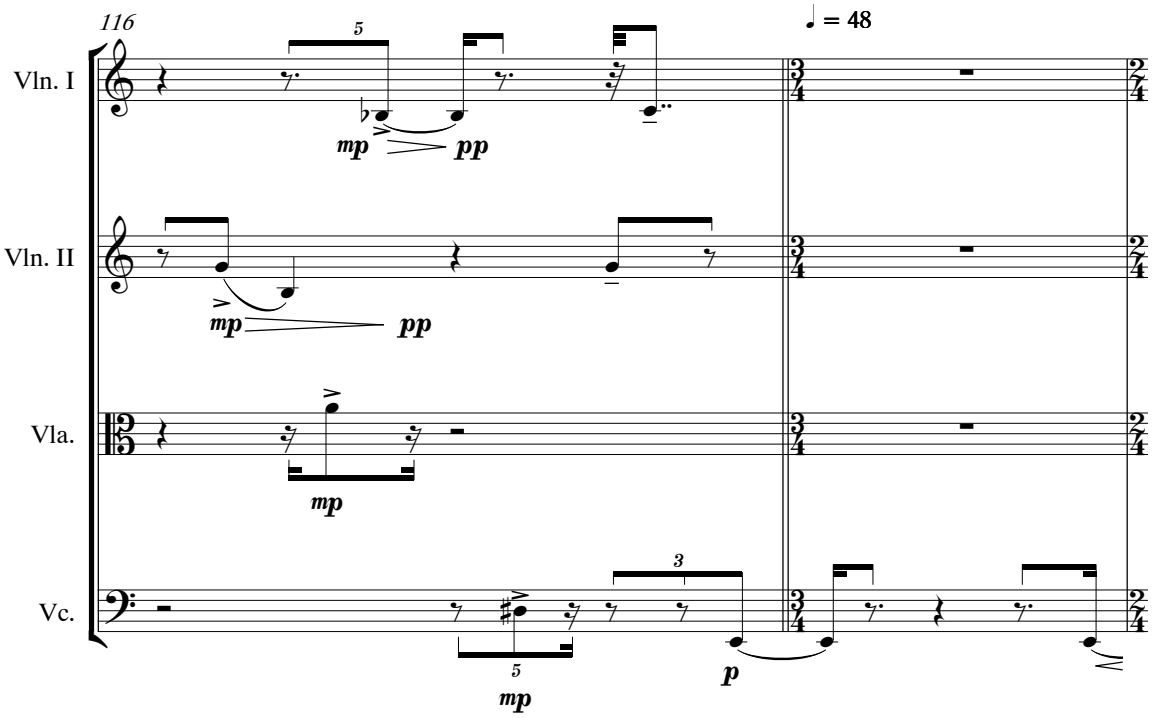

103
Vln. I
Vln. II
Vla.
Vc.
pp
f
p
pp
pp

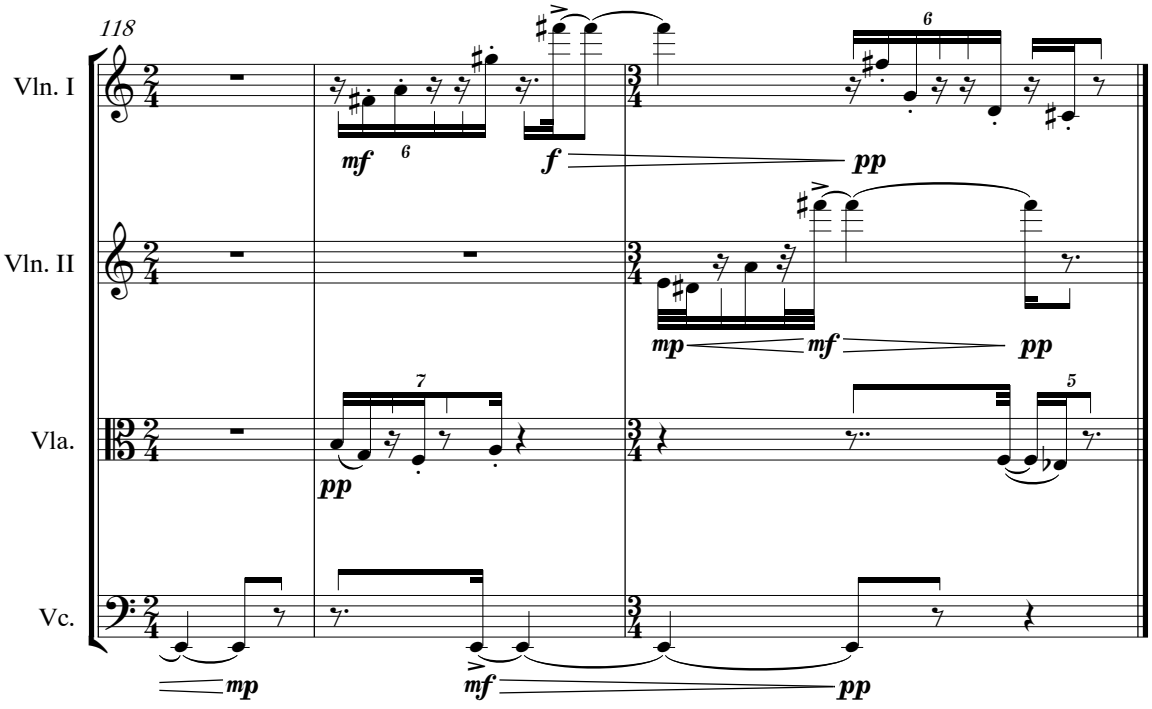

107
Vln. I
Vln. II
Vla.
Vc.
mp
f
mf
f


110
Vln. I
Vln. II
Vla.
Vc.
ff
mp
p
p
ff
mf
ff
mf

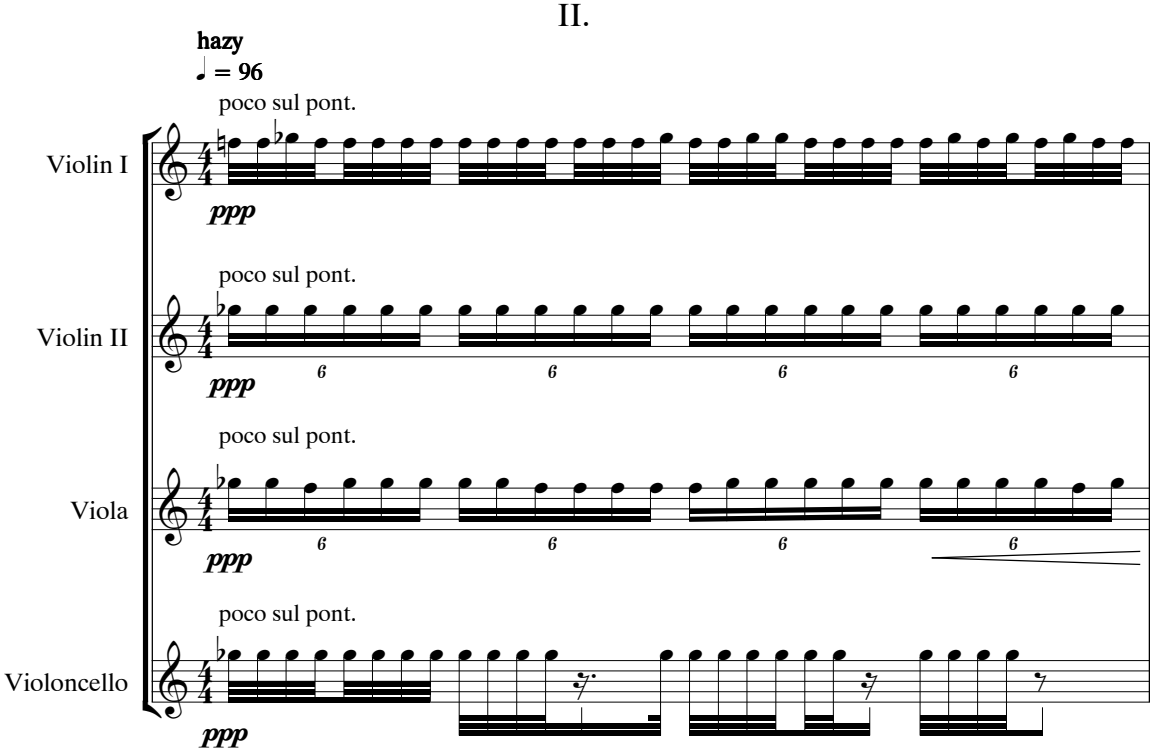

112
J
cold again
♩ = 52
Vln. I
Vln. II
Vla.
Vc.
mf
mp
p
pp
mf

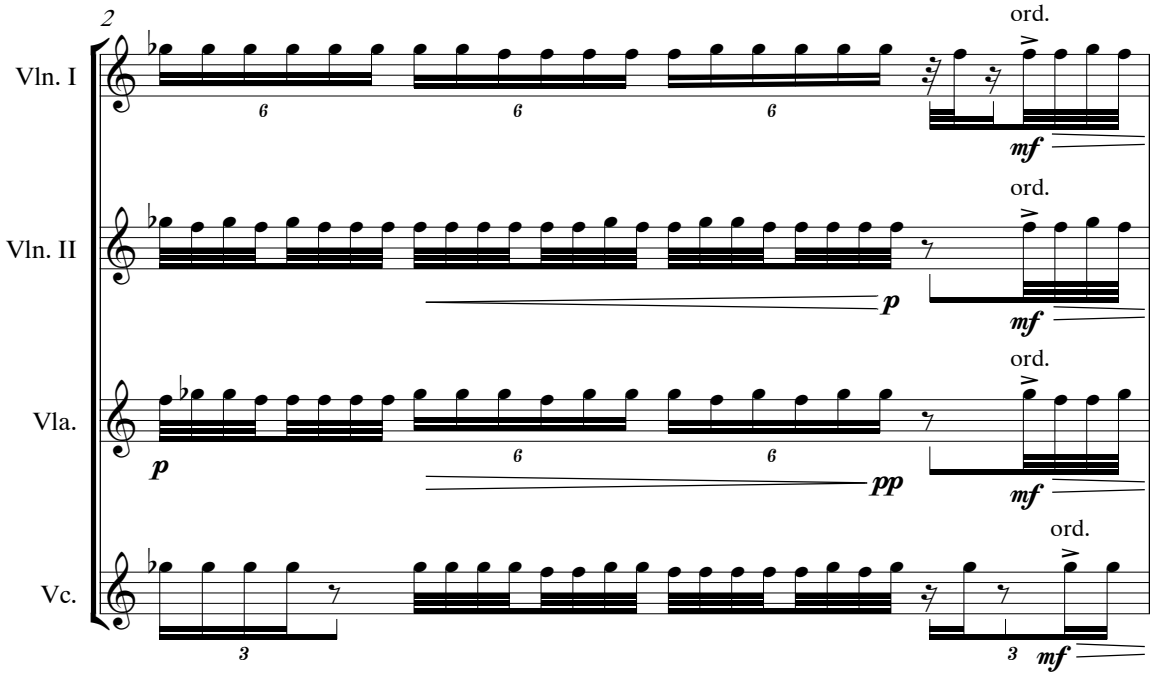

114
Vln. I
Vln. II
Vla.
Vc.
mp
pp
mf
pp
mf
pp
mf
p
p
mf
p

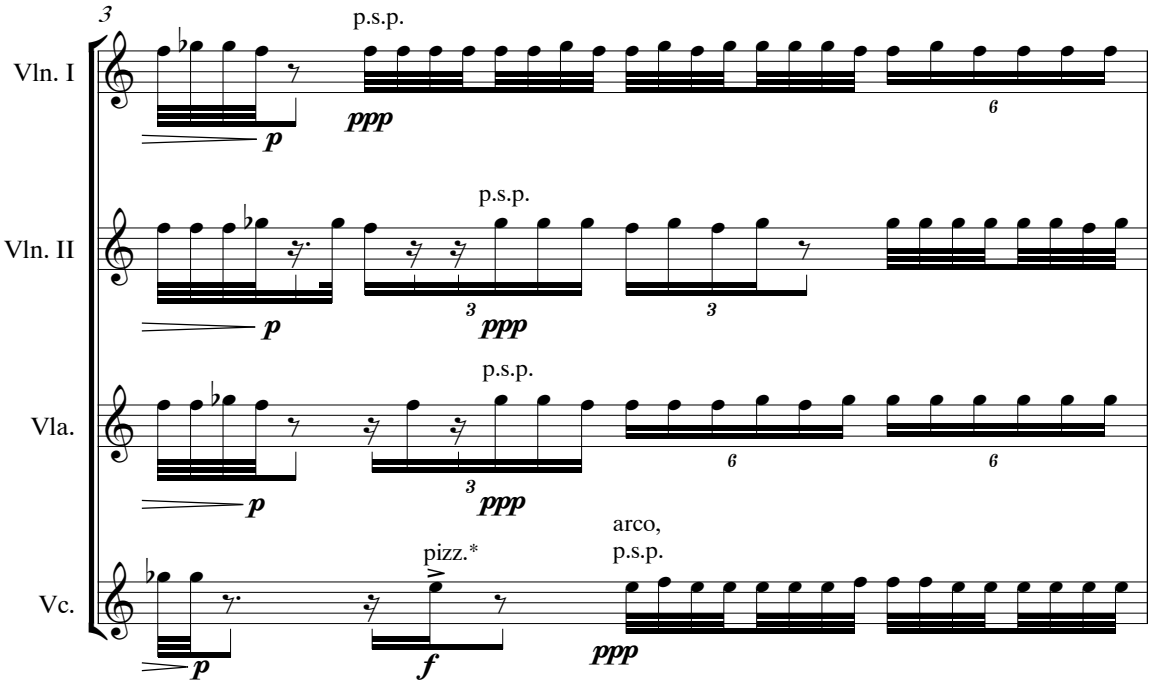

116
♩ = 48
Vln. I
Vln. II
Vla.
Vc.
mp
pp
mp
mp
p
mp


118
Vln. I
Vln. II
Vla.
Vc.
mf
f
pp
mp
mf
pp
pp
mp
mf
pp

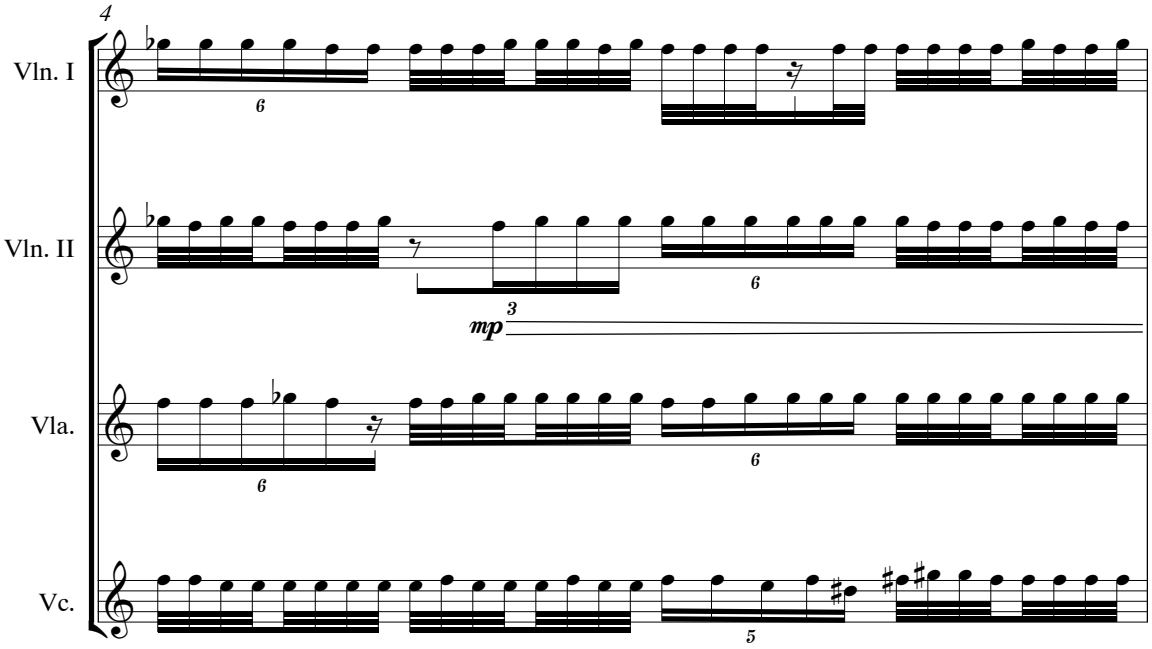
II.

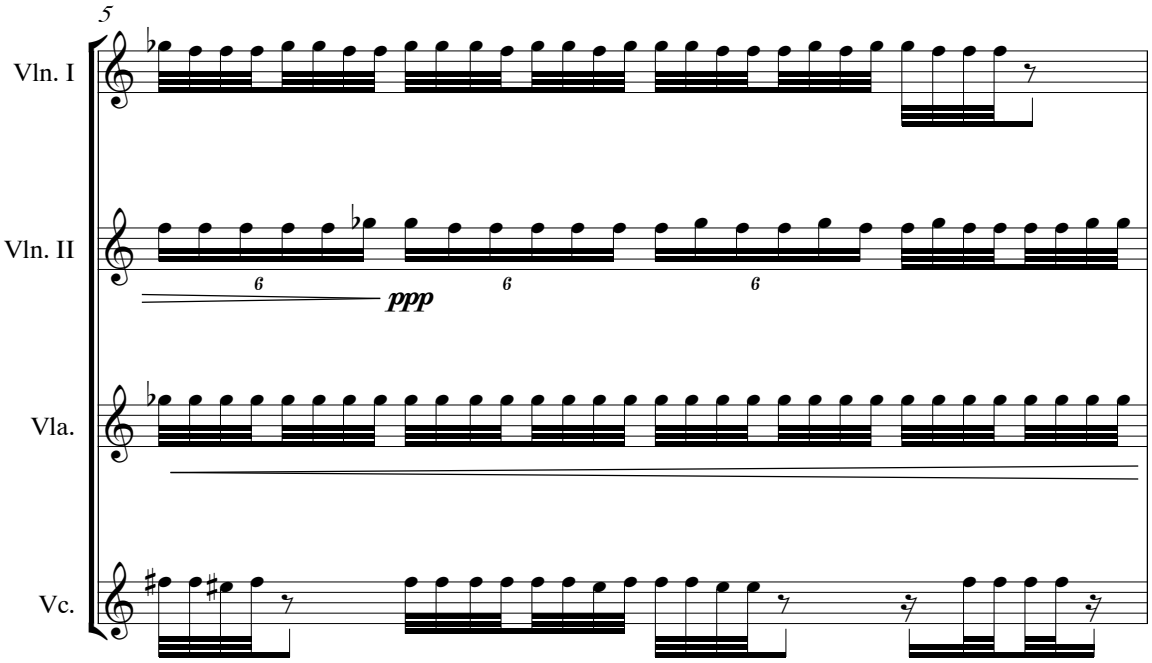

hazy
♩ = 96
poco sul pont.
Violin I
ppp
poco sul pont.
Violin II
ppp
poco sul pont.
Viola
ppp
poco sul pont.
Violoncello
ppp

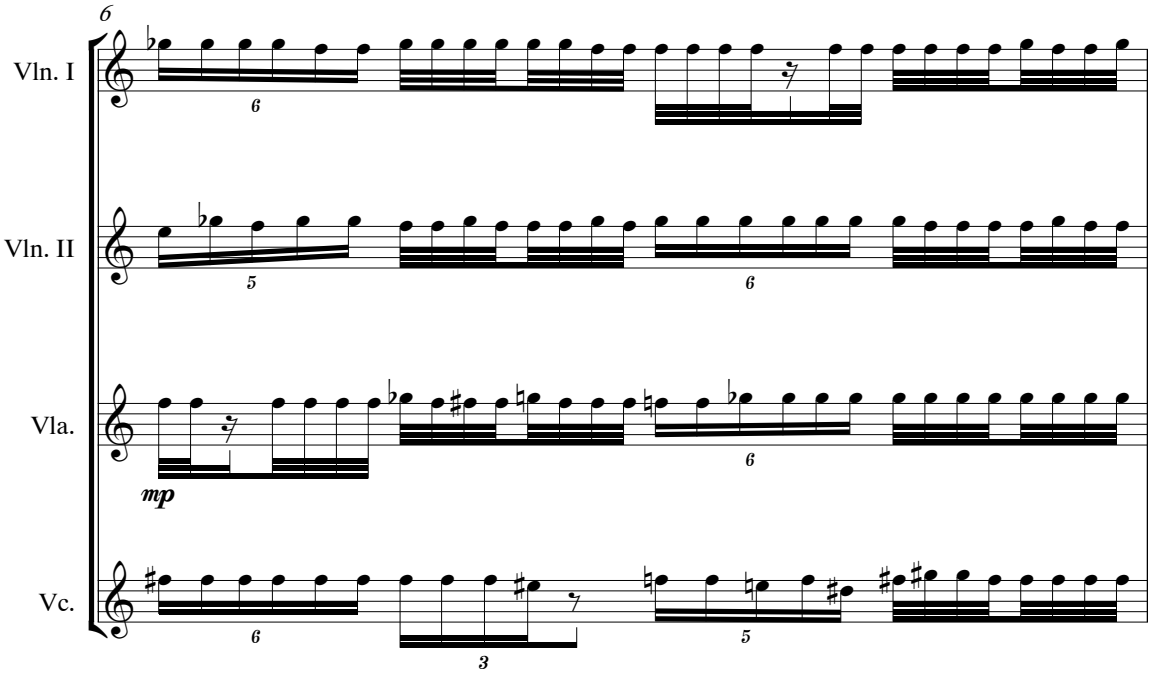

2
Vln. I
ord.
mf
Vln. II
p
ord.
mf
Vla.
p
pp
ord.
mf
Vc.
ord.
mf

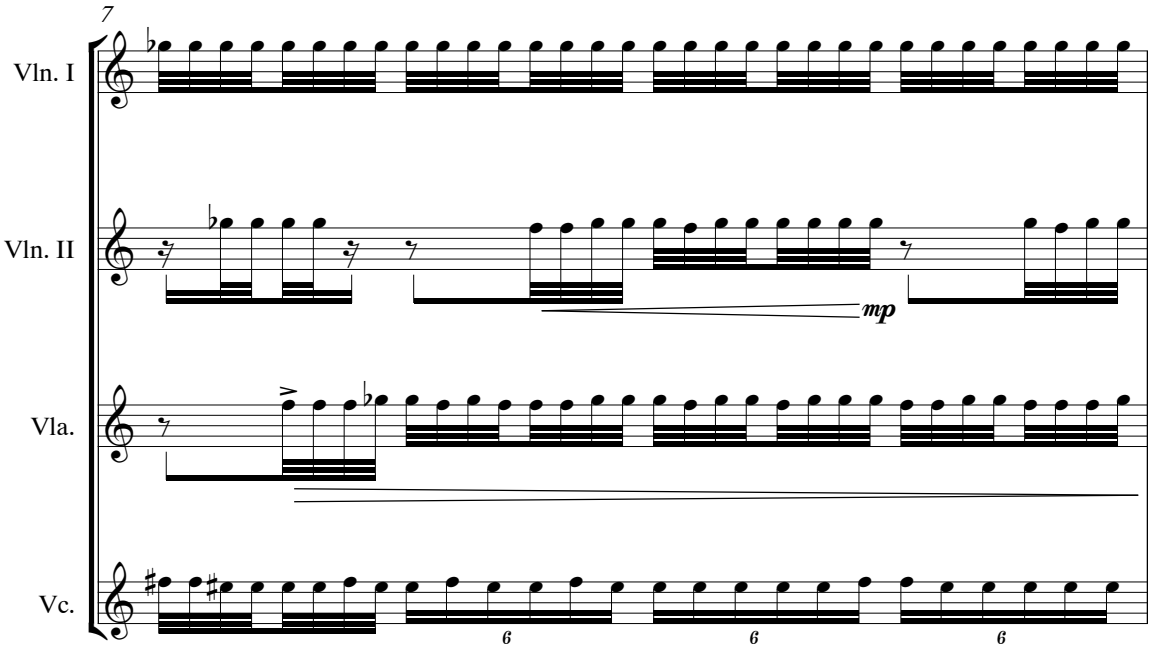


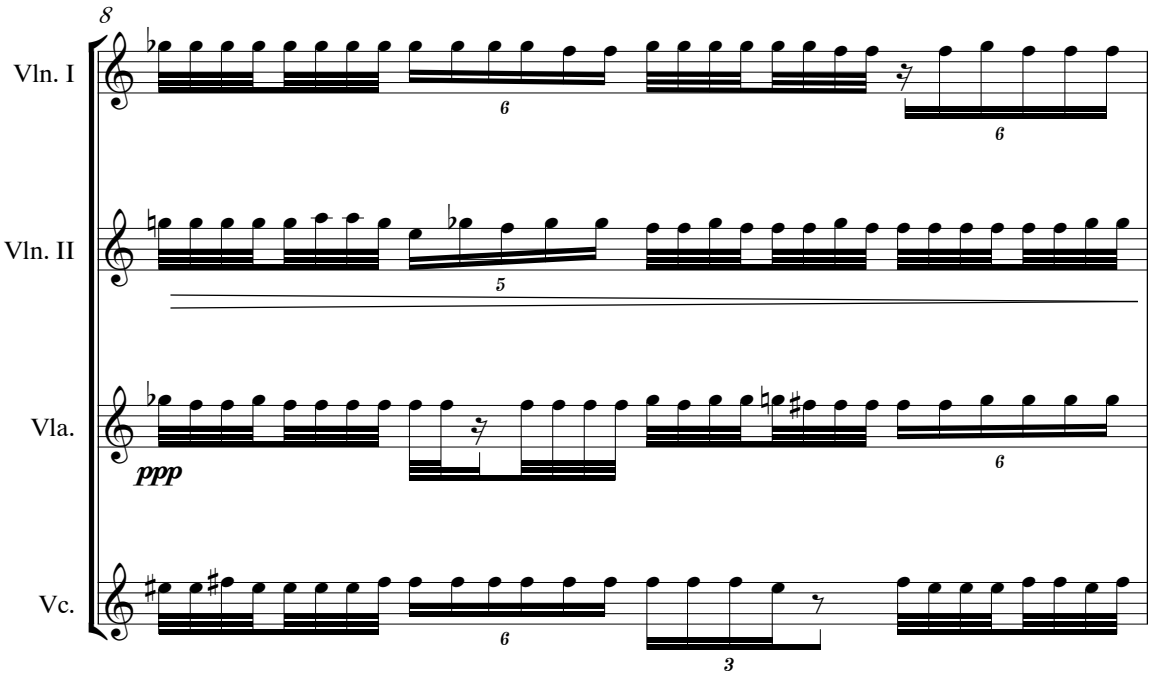
* - all pizzicati are performed ordinario, not sul pont

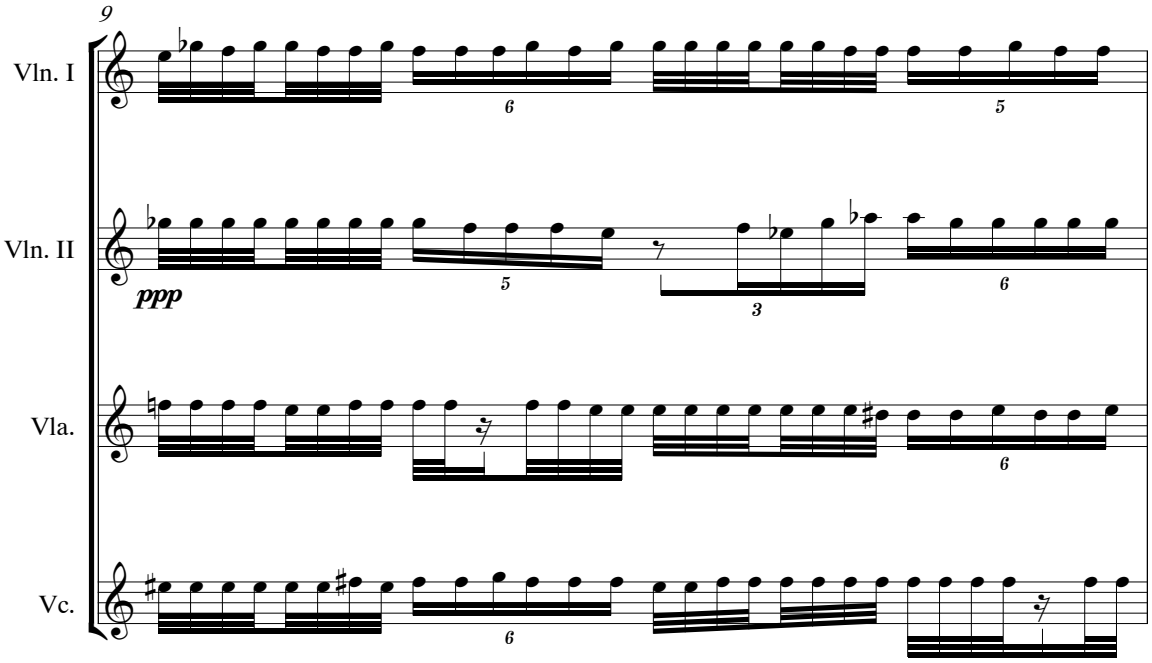


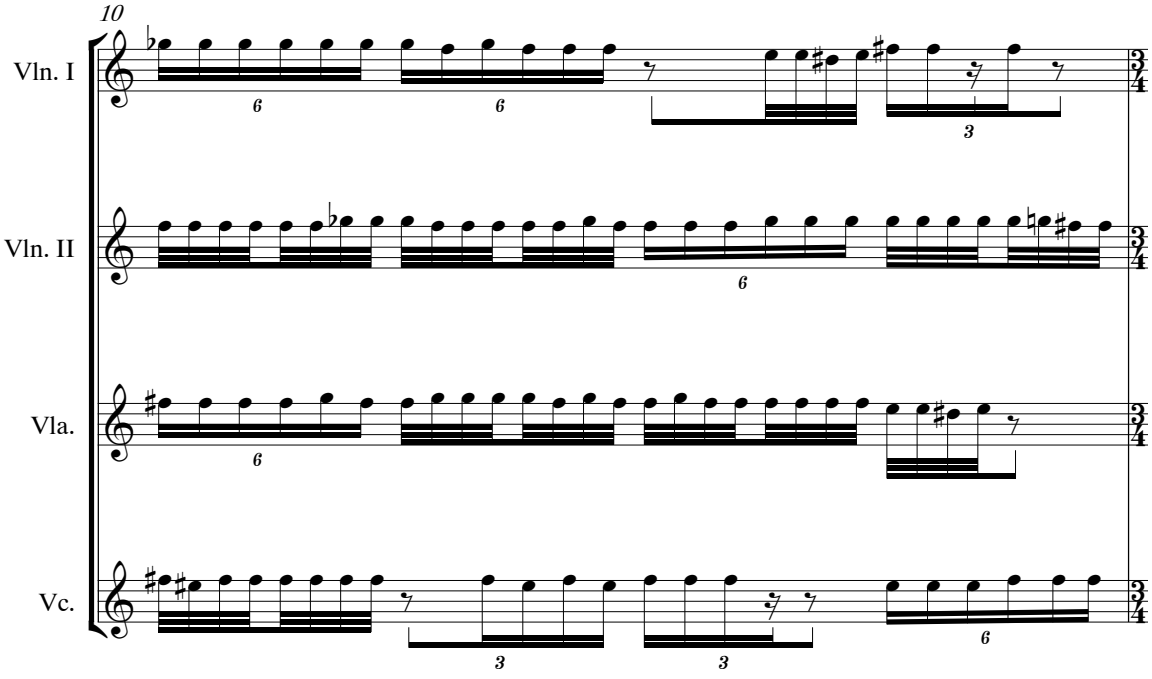

5
Vln. I
Vln. II
Vla.
Vc.
ppp

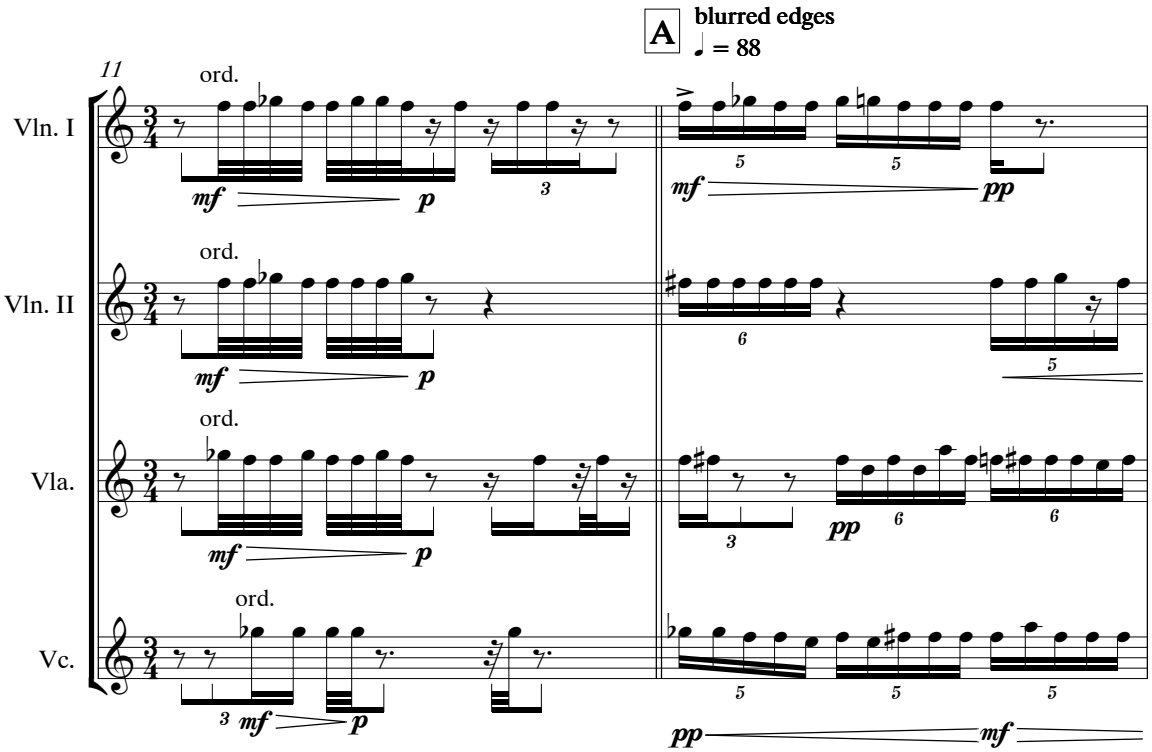

6
Vln. I
Vln. II
Vla.
Vc.
mp

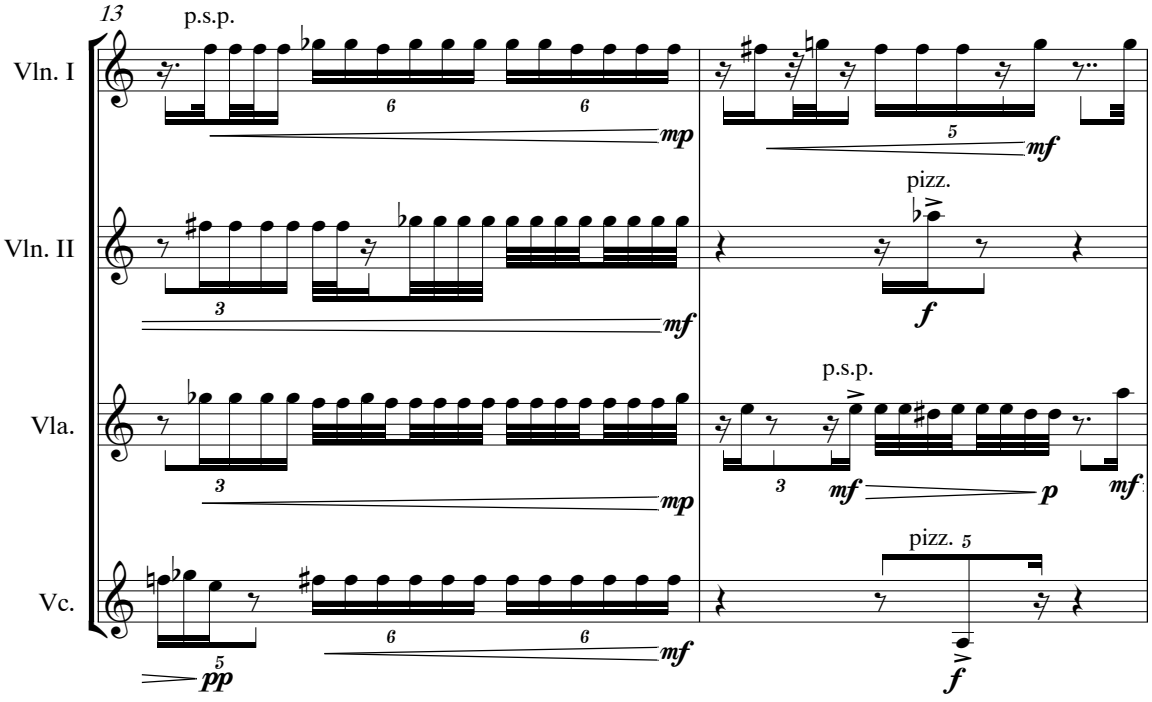

7
Vln. I
Vln. II
Vla.
Vc.
mp
6
6
6

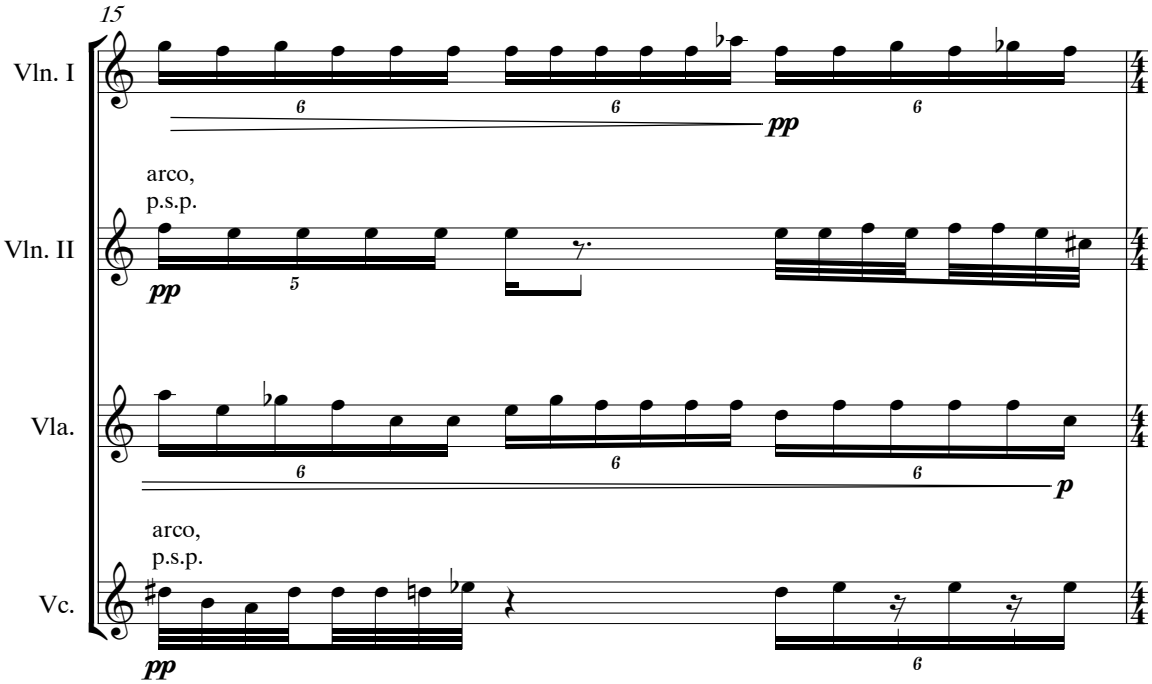

8
Vln. I
Vln. II
Vla.
Vc.
6
6
5
ppp
6
6
3

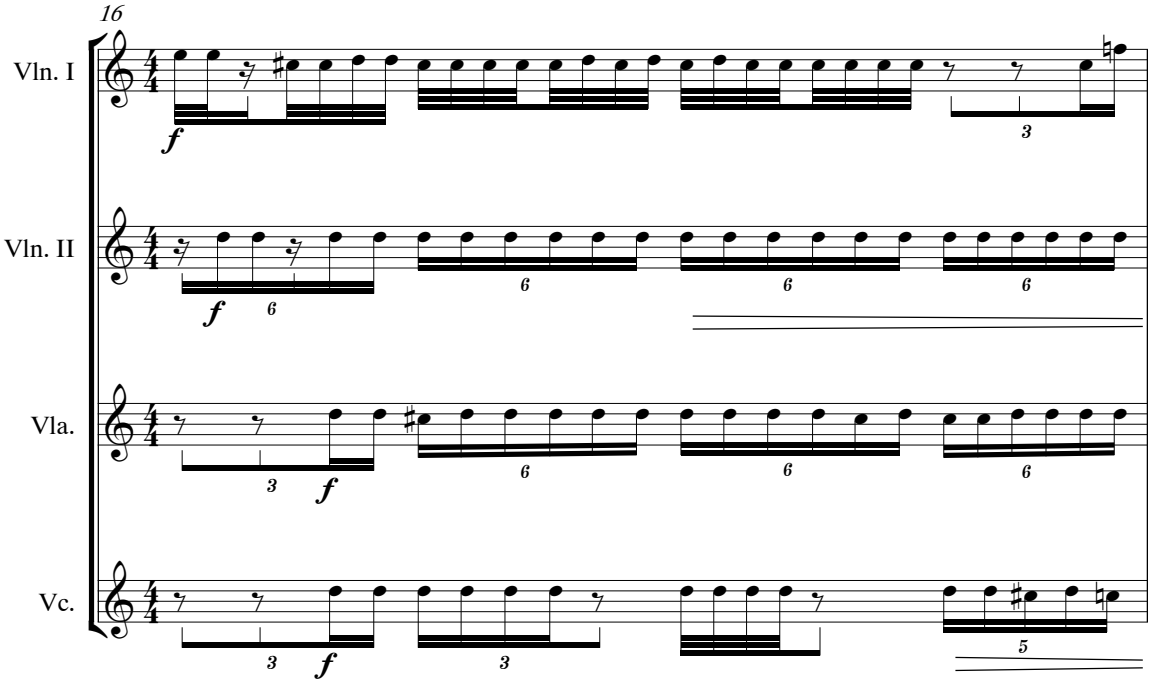

9
Vln. I
Vln. II
ppp
Vla.
Vc.

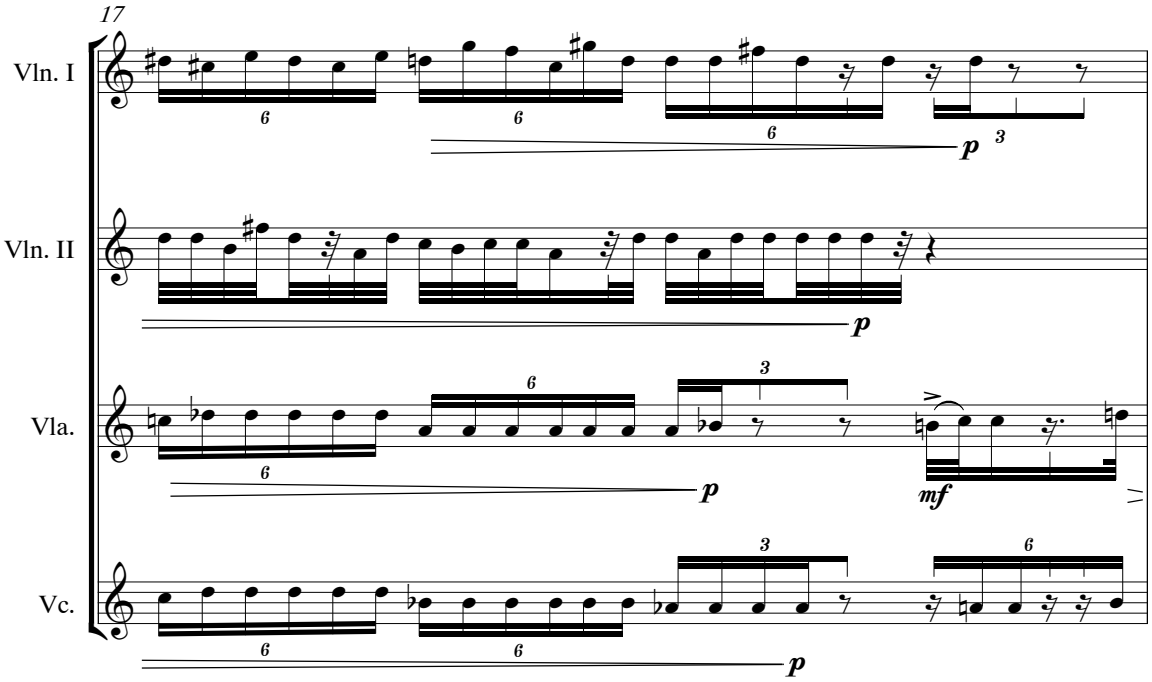

10
Vln. I
Vln. II
Vla.
Vc.

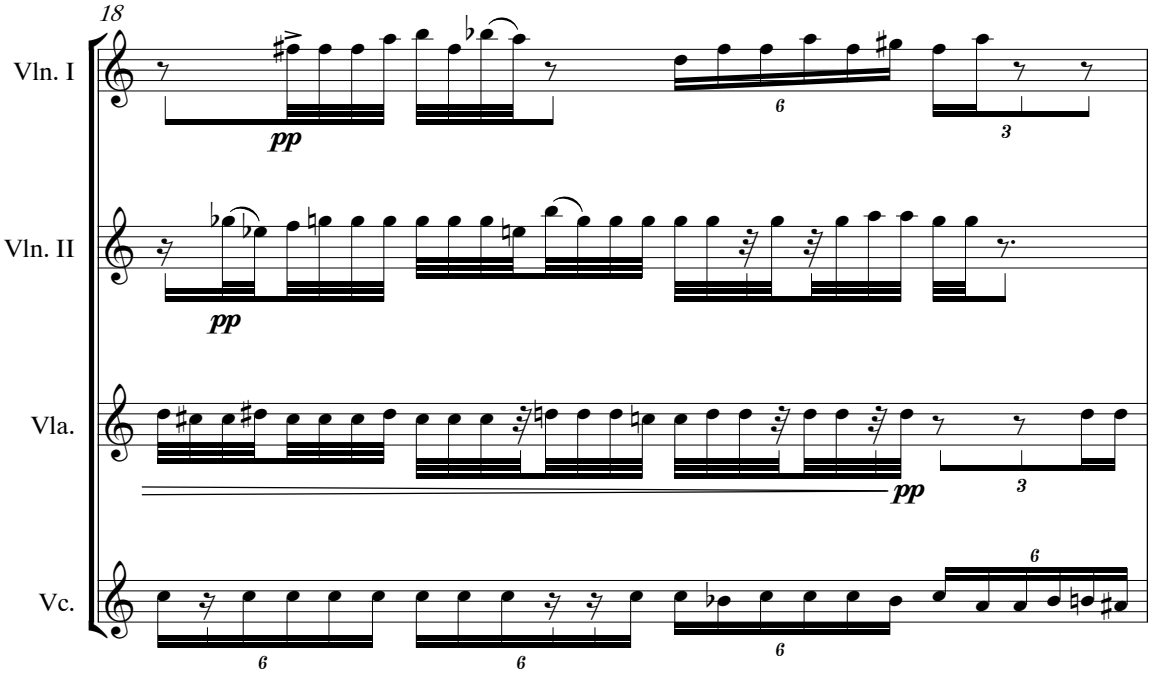

A
blurred edges
♩ = 88
11
Vln. I
Vln. II
Vla.
Vc.
ord.
mf
p
pp
mf

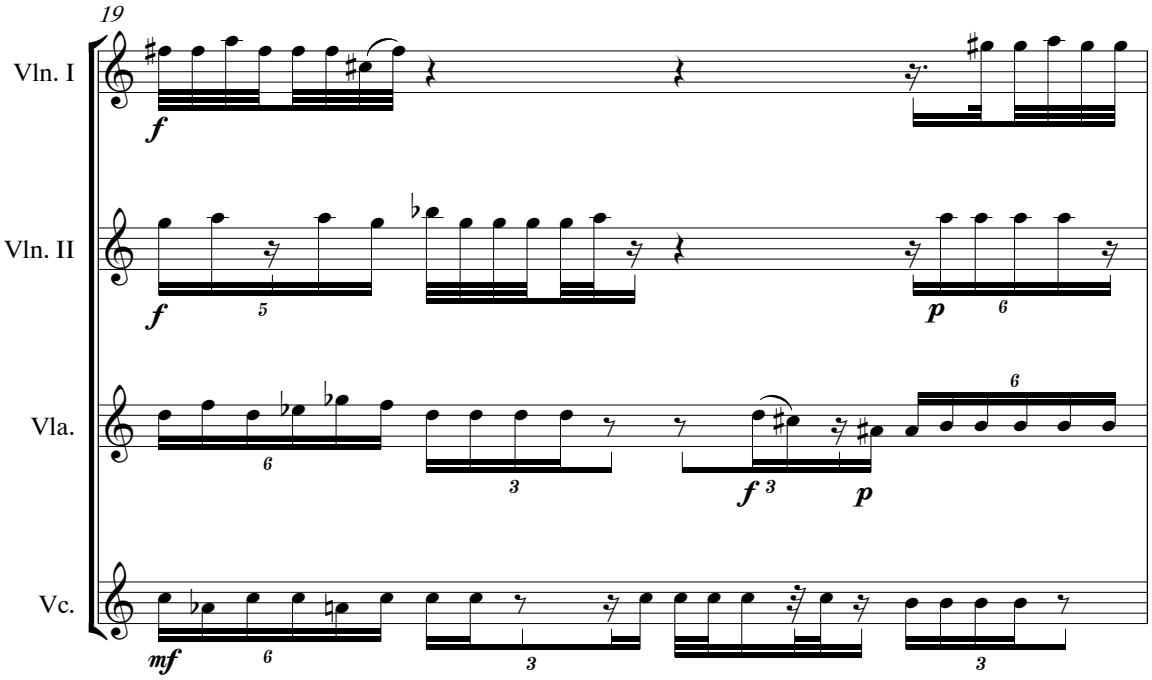

13
Vln. I
Vln. II
Vla.
Vc.
p.s.p.
mp
mf
pizz.
f
p.s.p.
pizz.
pp
f

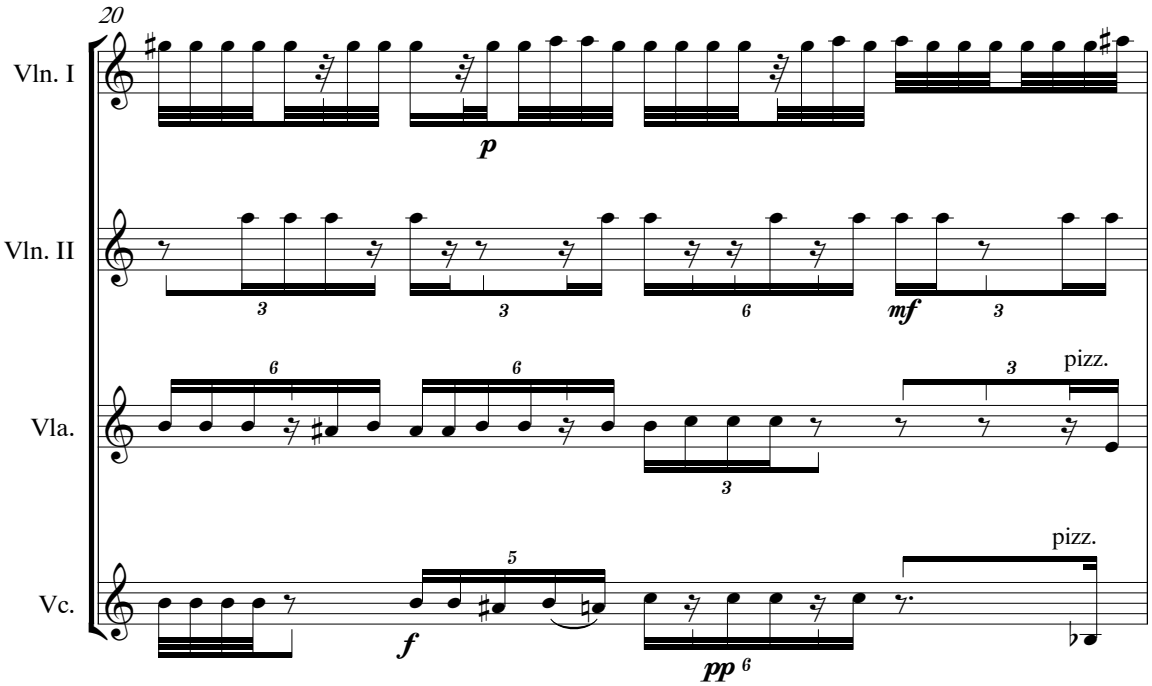

15
Vln. I
Vln. II
Vla.
Vc.
arco,
p.s.p.
arco,
p.s.p.
pp
pp
p
pp

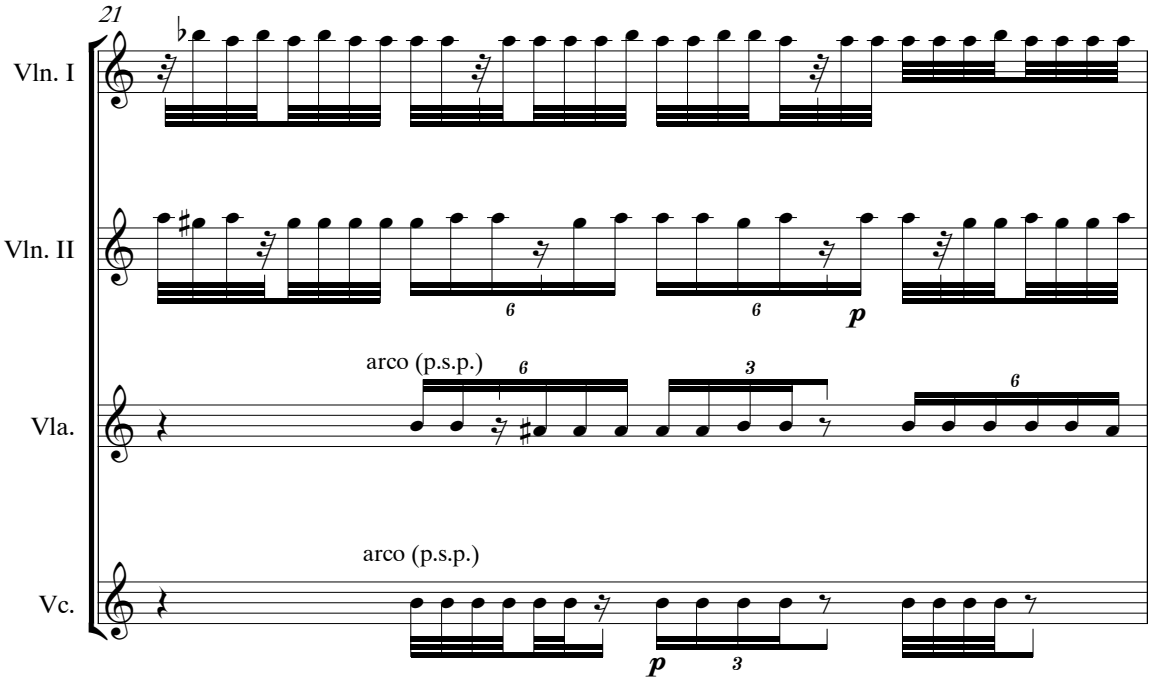

16
Vln. I
Vln. II
Vla.
Vc.
f
f
f
f

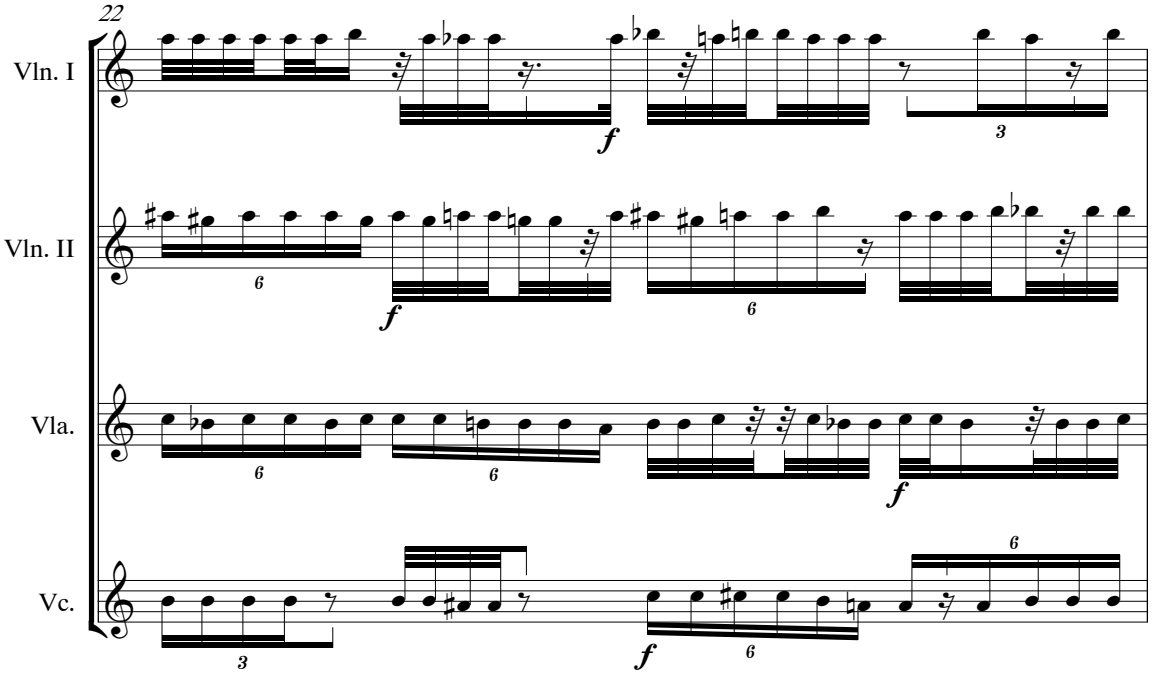

17
Vln. I
Vln. II
Vla.
Vc.
p
mf

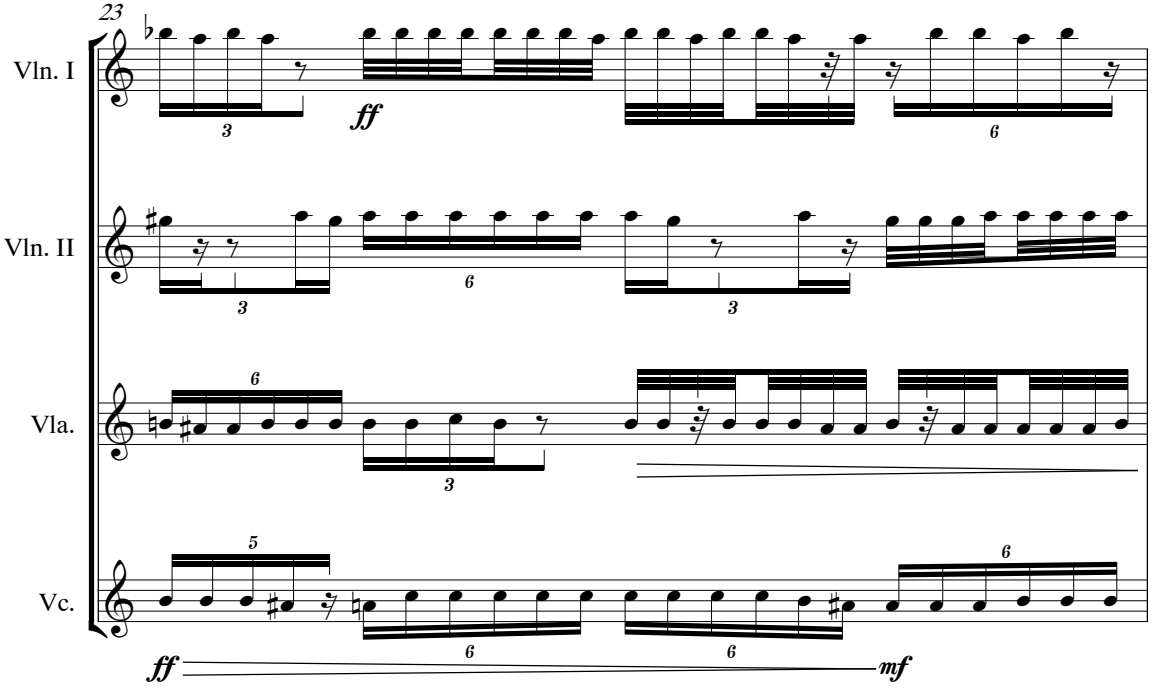

18
Vln. I
Vln. II
Vla.
Vc.
pp

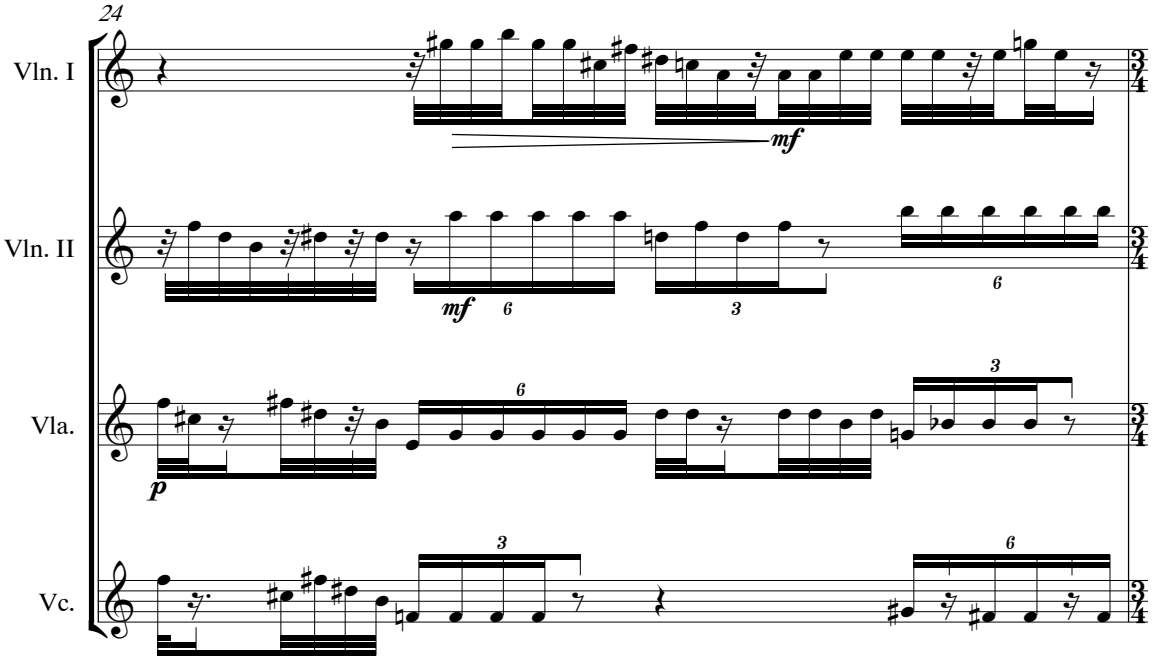

19
Vln. I
Vln. II
Vla.
Vc.
f
mf
p

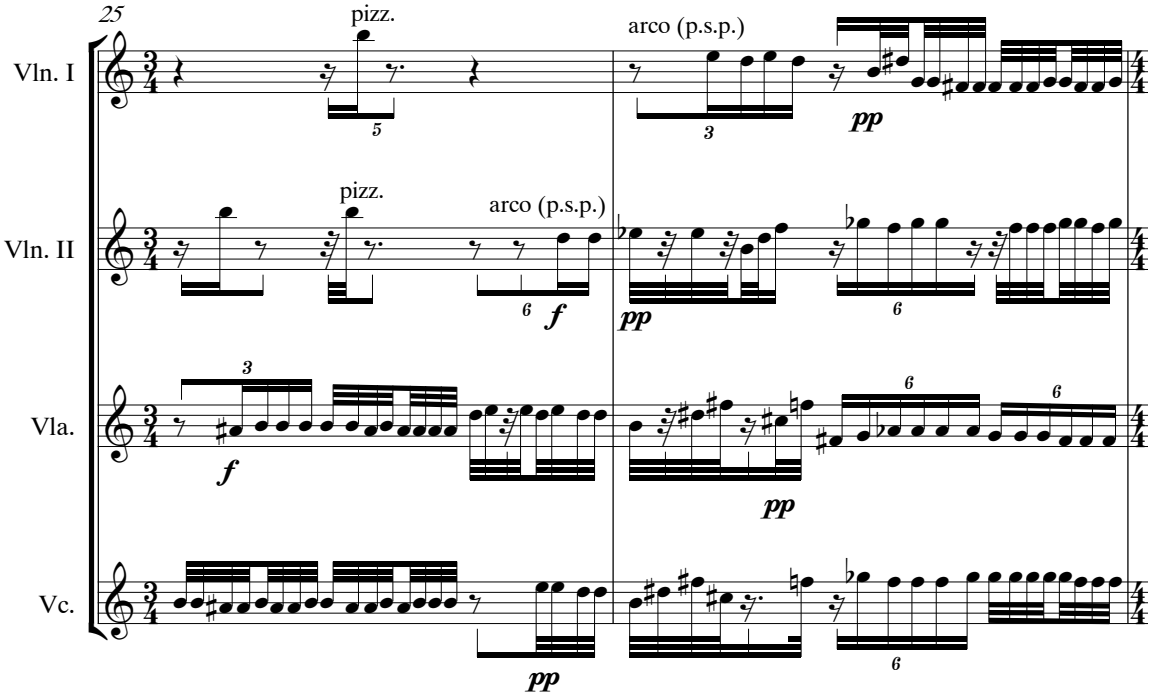

20
Vln. I
Vln. II
Vla.
Vc.
p
mf
f
pp
pizz.
pizz.

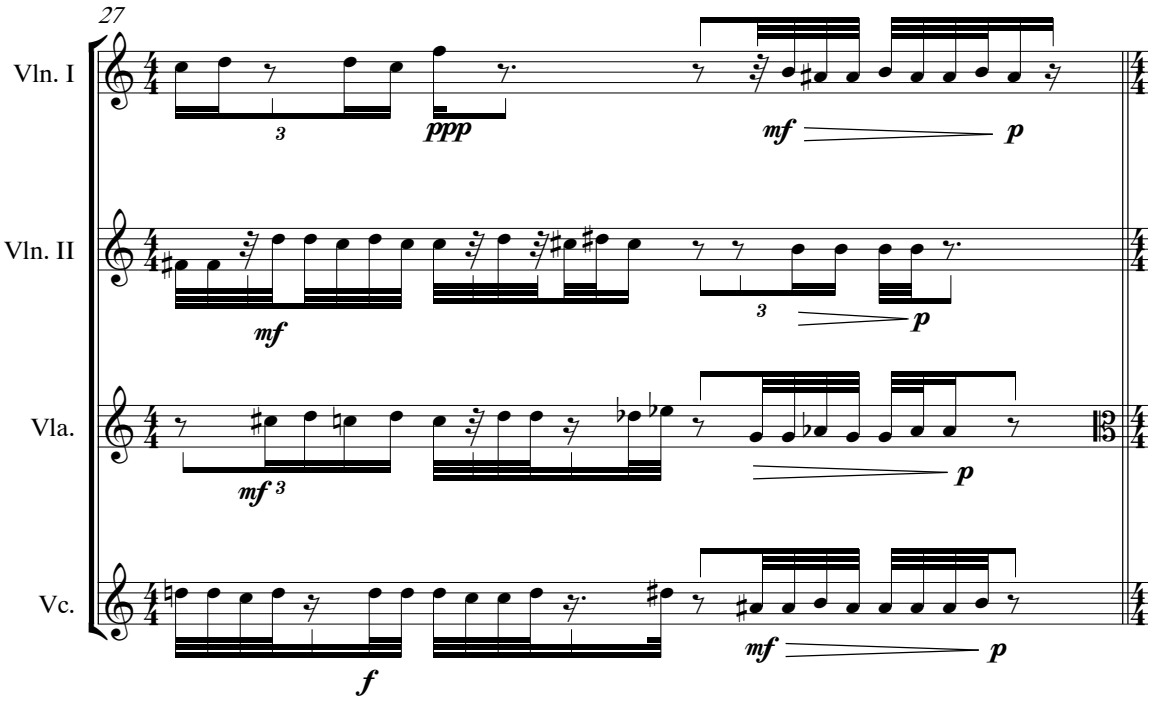

21
Vln. I
Vln. II
Vla.
Vc.
arco (p.s.p.)
arco (p.s.p.)
p
p

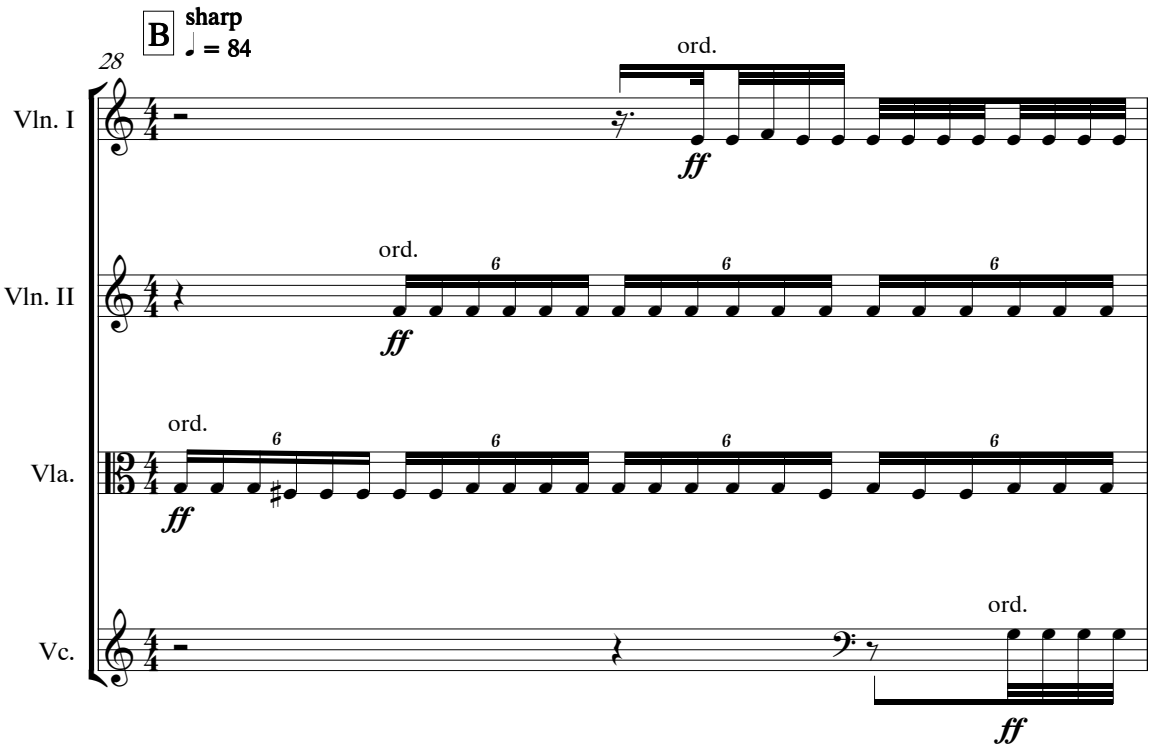

22
Vln. I
Vln. II
Vla.
Vc.
f
f
f
f

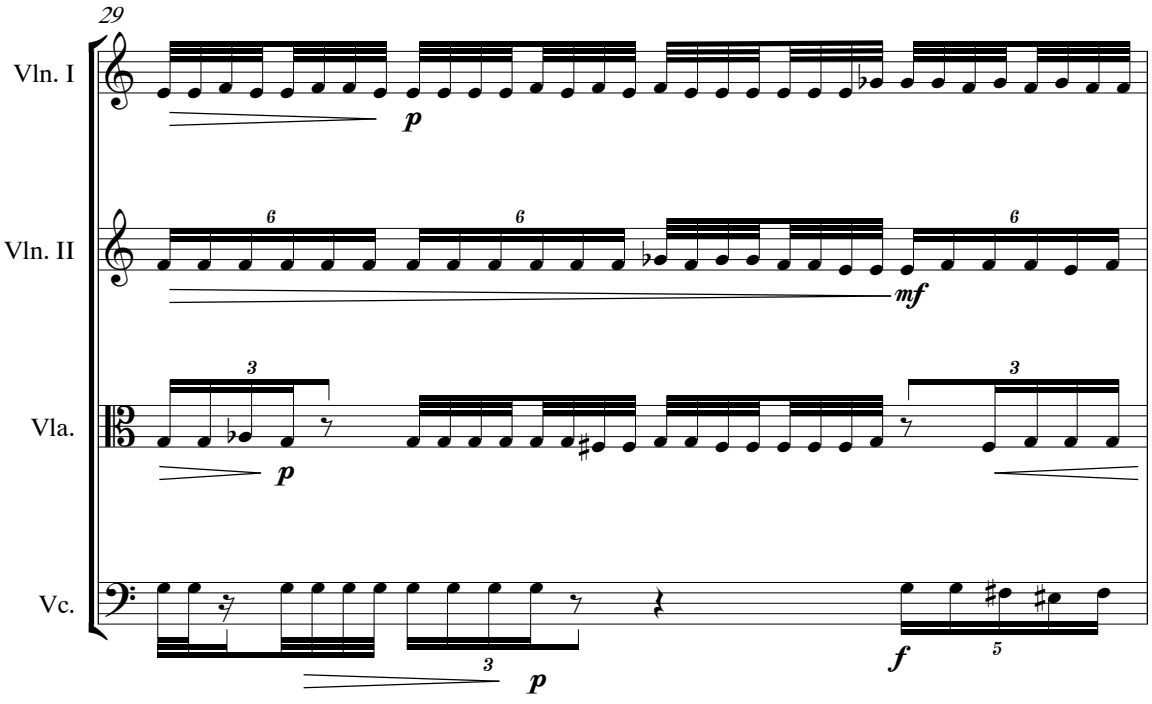

23
Vln. I
Vln. II
Vla.
Vc.
ff
mf

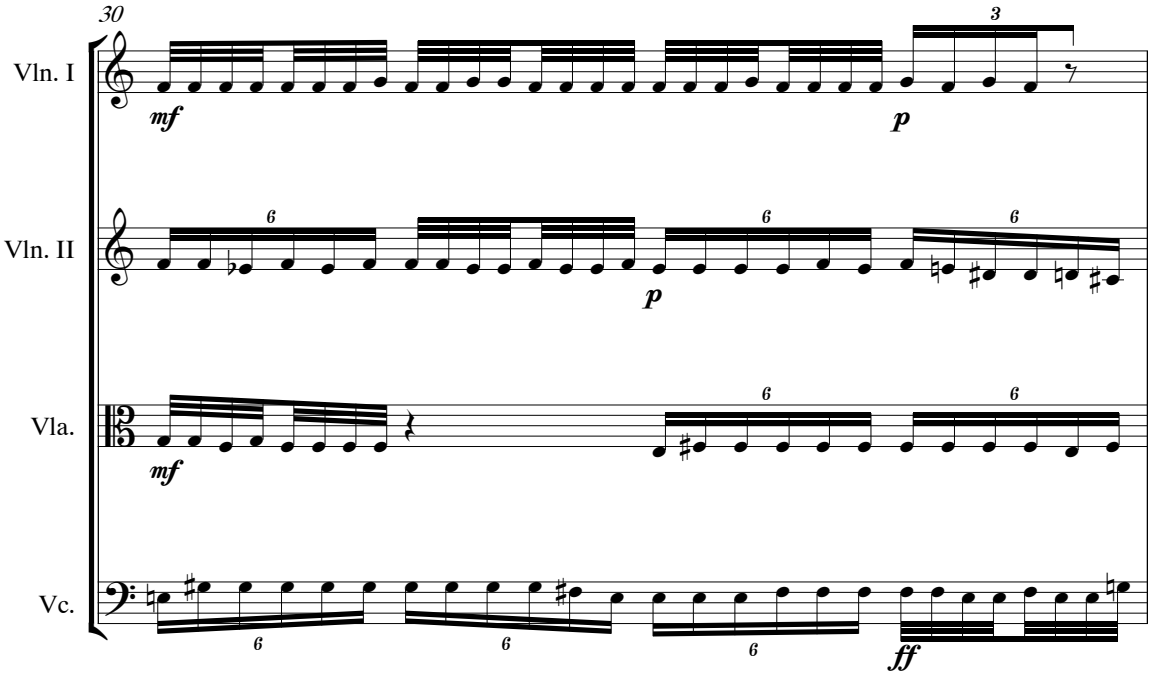

24
Vln. I
Vln. II
Vla.
Vc.
mf
p

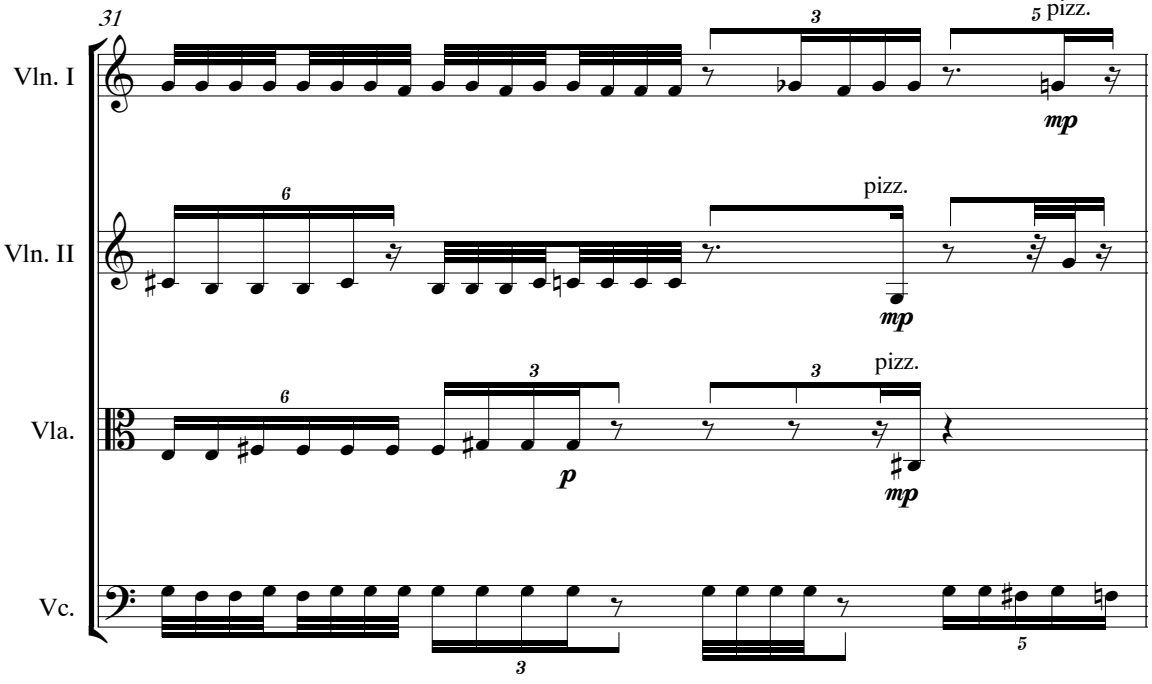

25
Vln. I
Vln. II
Vla.
Vc.
pizz.
arco (p.s.p.)
pizz.
arco (p.s.p.)
pp
f
pp
f
pp
pp

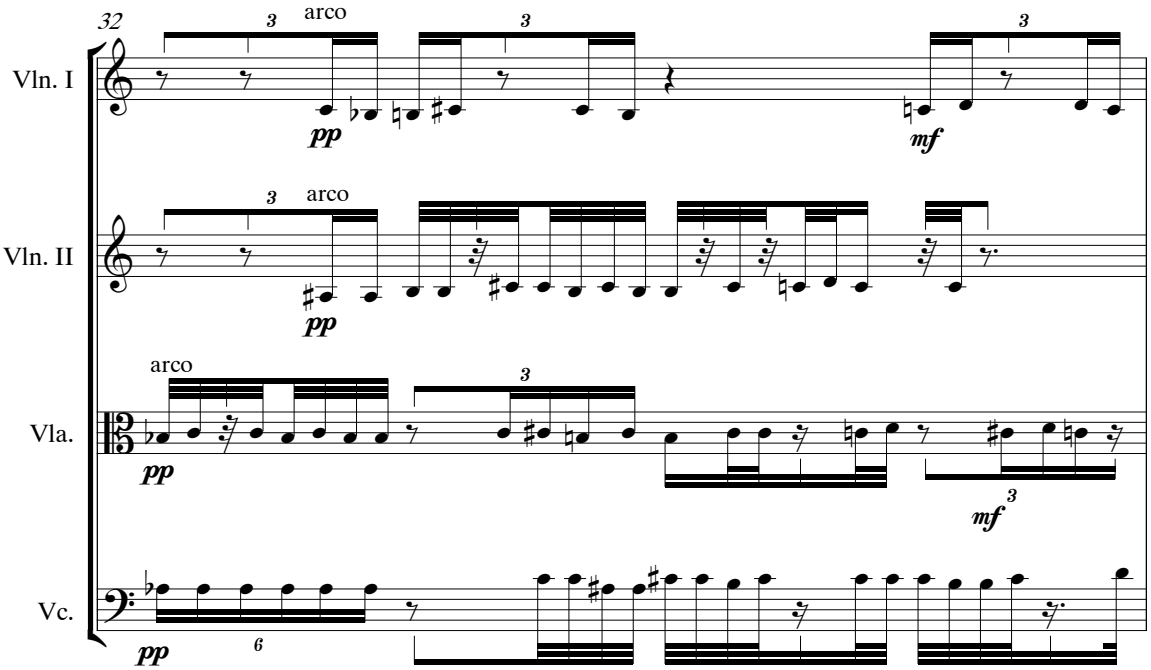

27
Vln. I
Vln. II
Vla.
Vc.
ppp
mf
p
mf
p
mf
p
f
mf
p

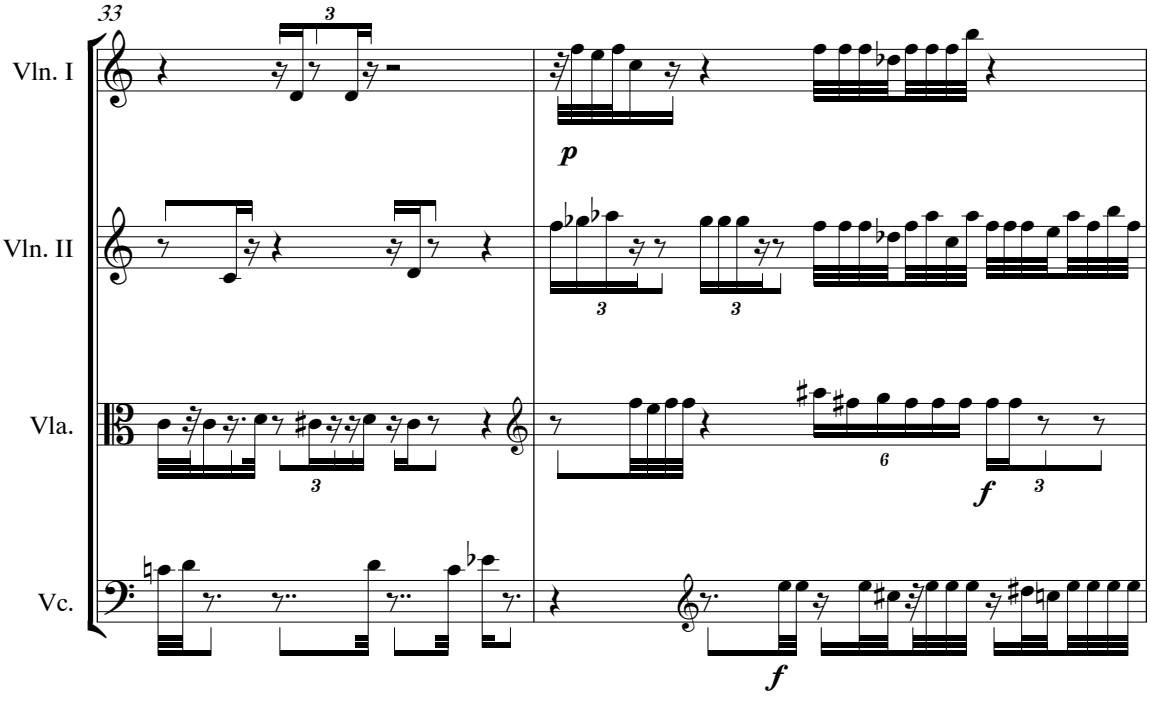

B
sharp
♩ = 84
28
Vln. I
Vln. II
Vla.
Vc.
ord.
ff
6
ord.
ff
6
ord.
ff
6
ord.
ff

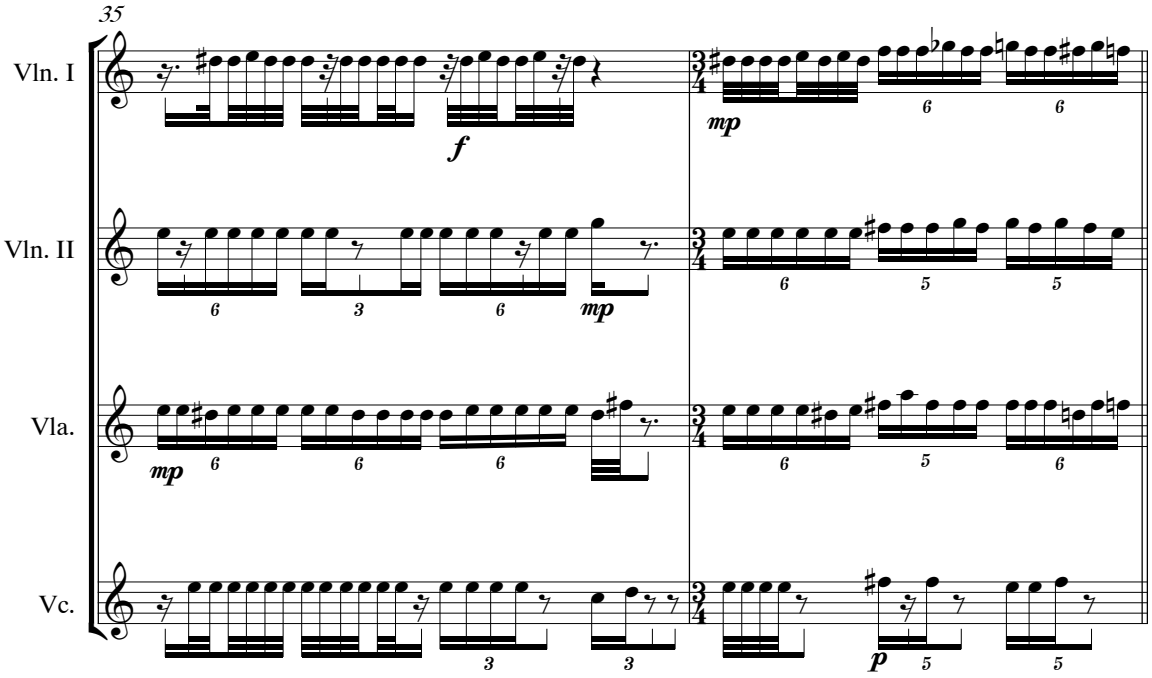

29
Vln. I
Vln. II
Vla.
Vc.
p
6
mf
3
p
3
p
f
5

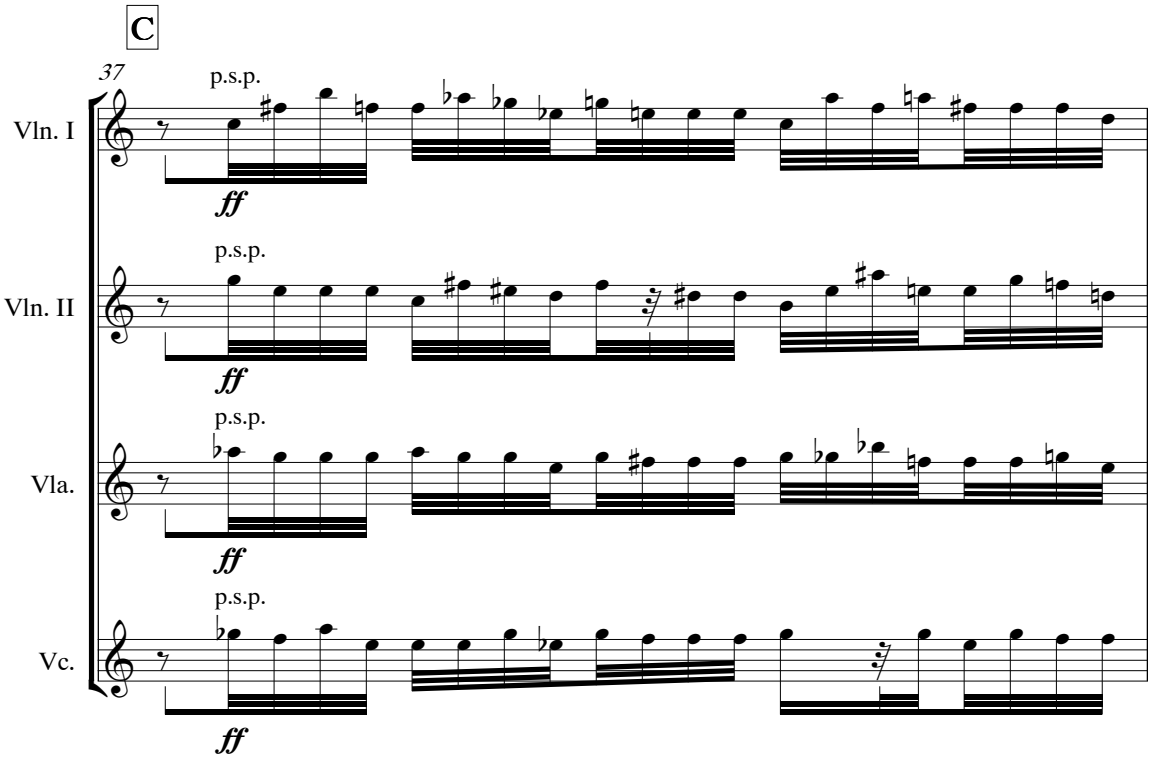

30
Vln. I
Vln. II
Vla.
Vc.
mf
p
mf
ff

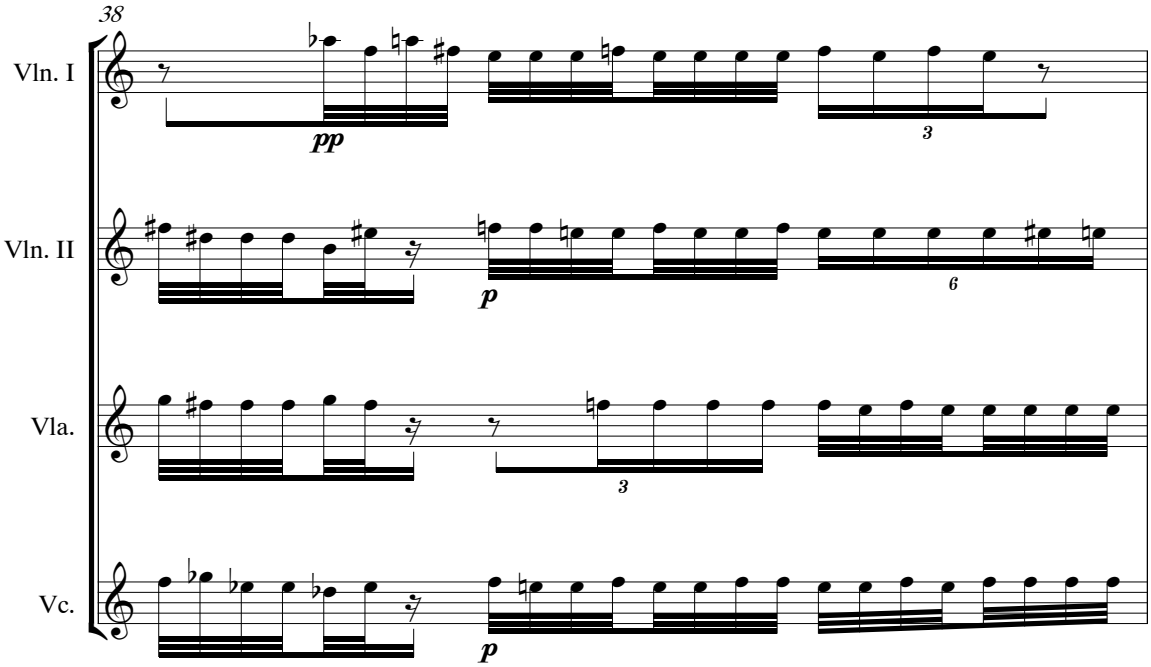

31
Vln. I
Vln. II
Vla.
Vc.
5 pizz.
mp
pizz.
mp
pizz.
p
mp

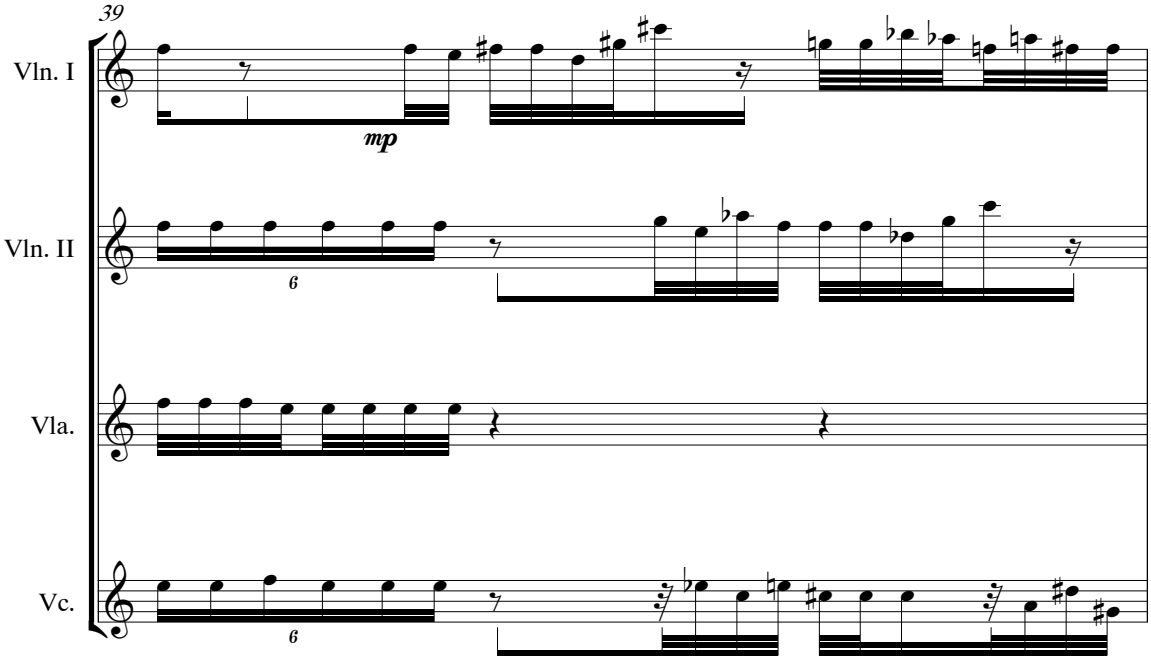

32
Vln. I
arco
pp
mf
Vln. II
arco
pp
Vla.
arco
pp
mf
Vc.
pp

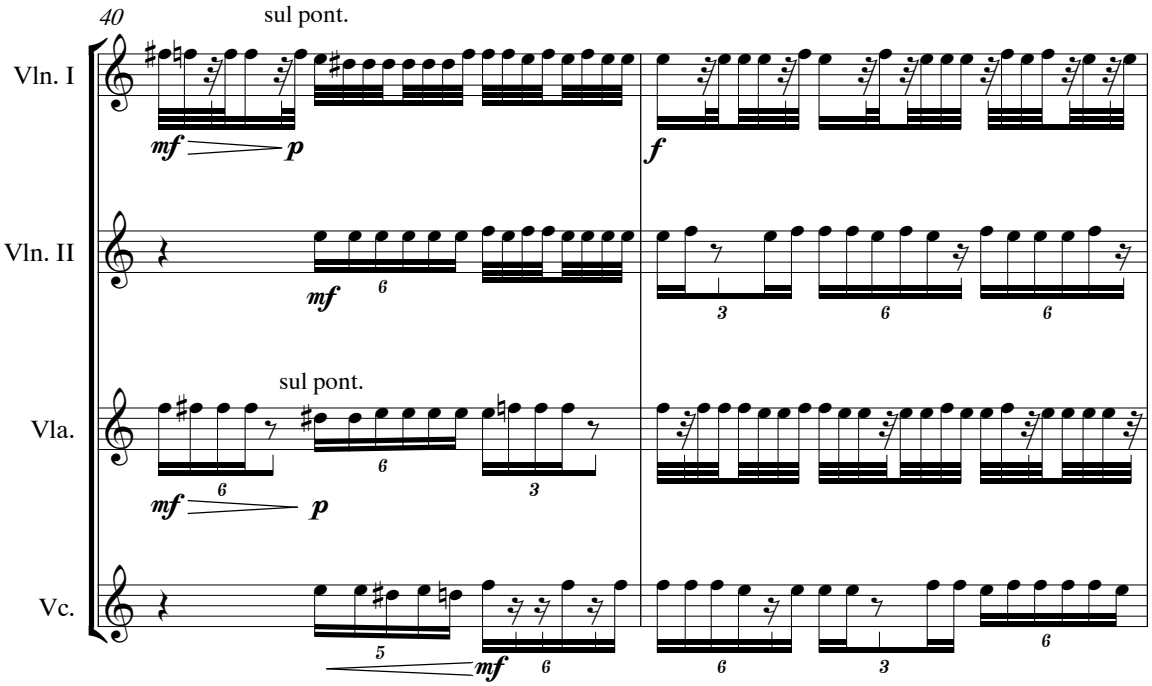

33
Vln. I
p
Vln. II
Vla.
f
Vc.
f

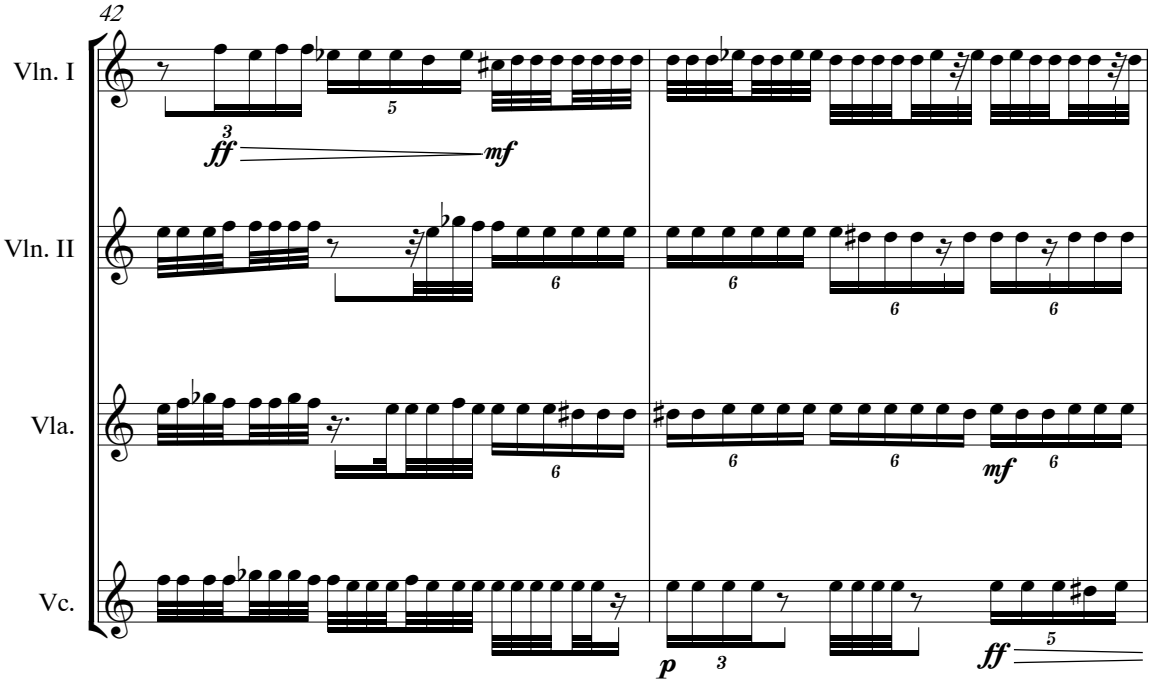

35
Vln. I
Vln. II
Vla.
Vc.
f
mp
p

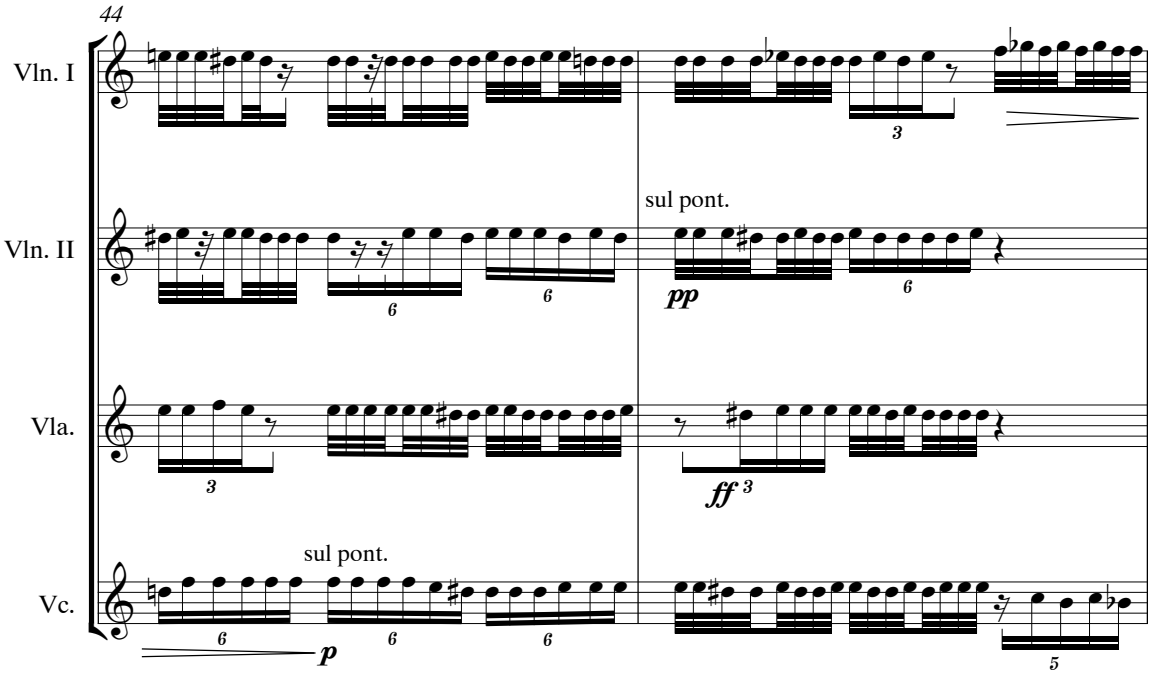

C
37
Vln. I
Vln. II
Vla.
Vc.
p.s.p.
ff

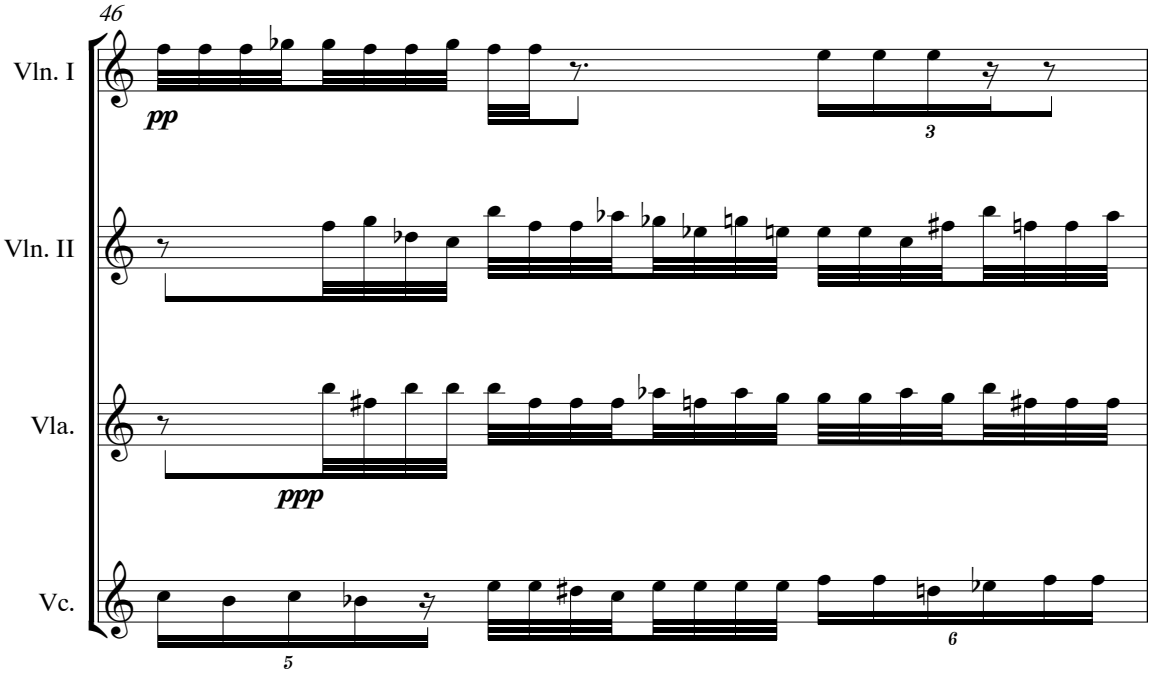

38
Vln. I
Vln. II
Vla.
Vc.
pp
p
p
3
6
3

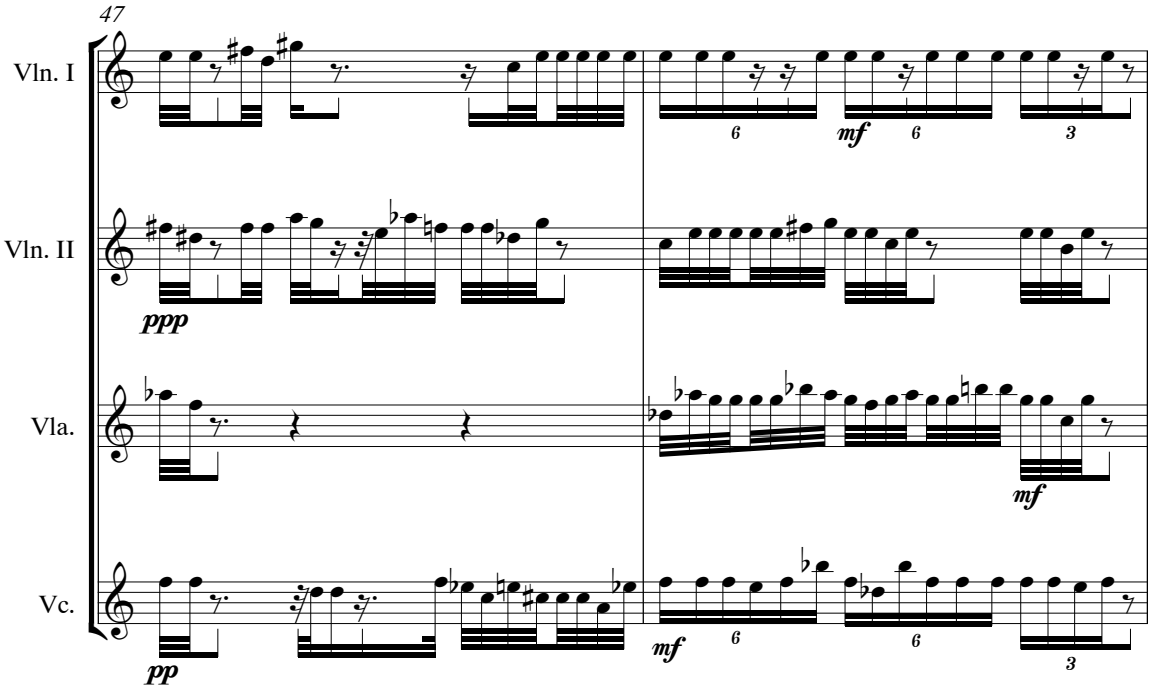

39
Vln. I
Vln. II
Vla.
Vc.
mp
6
6

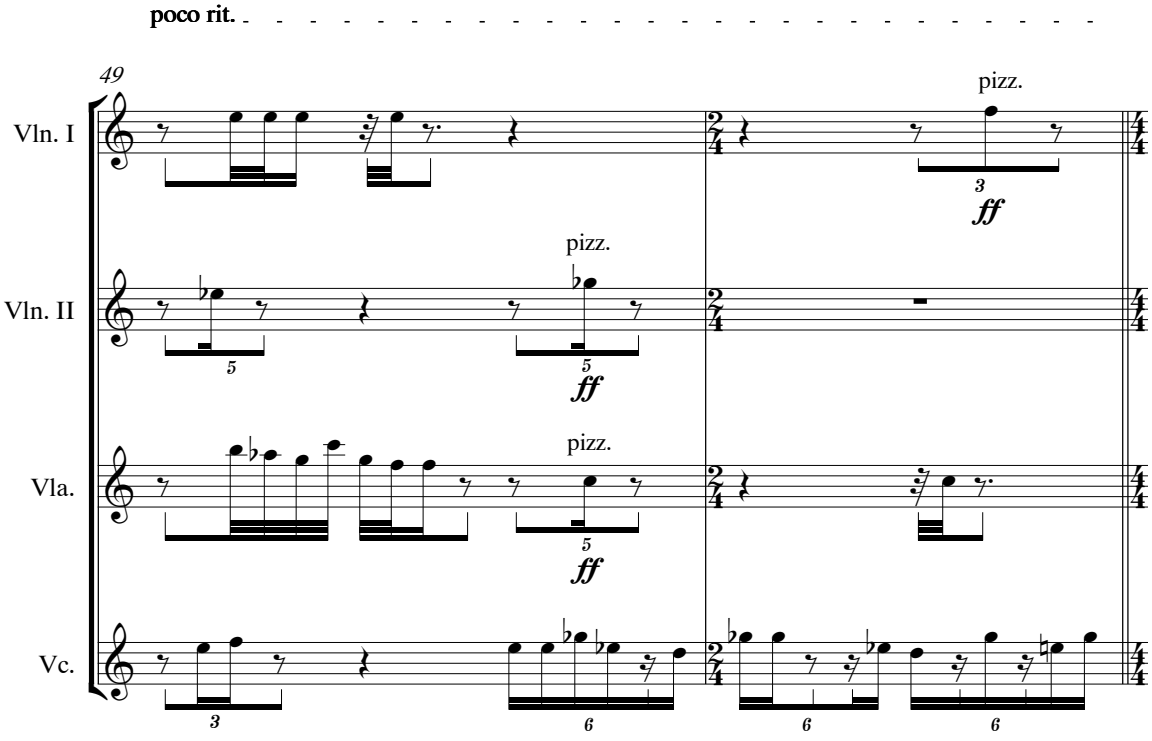

40
sul pont.
Vln. I
Vln. II
sul pont.
Vla.
Vc.

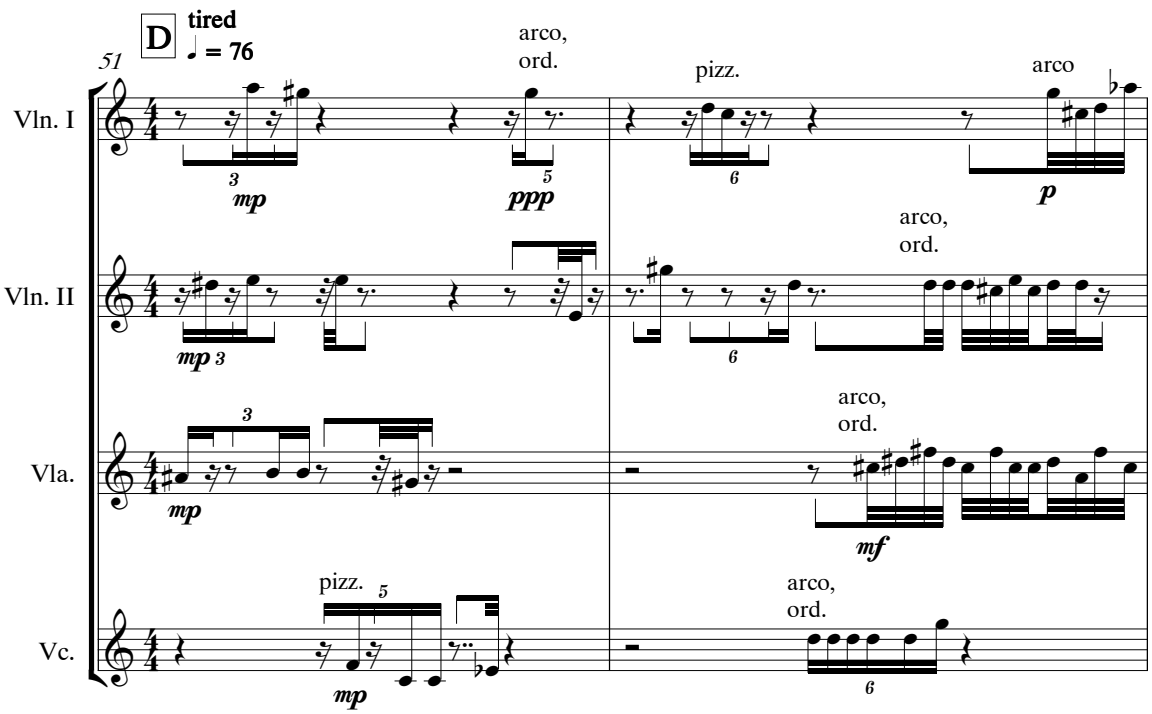

42
Vln. I
Vln. II
Vla.
Vc.

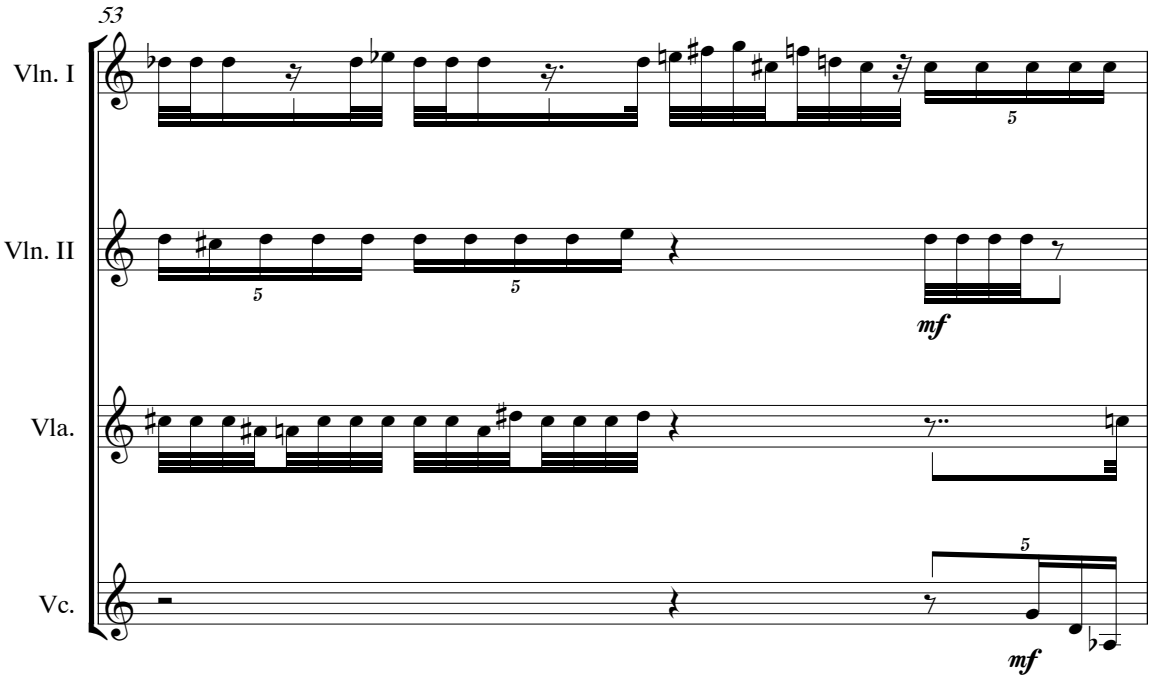

44
Vln. I
Vln. II
Vla.
Vc.
sul pont.
sul pont.
pp
ff
p

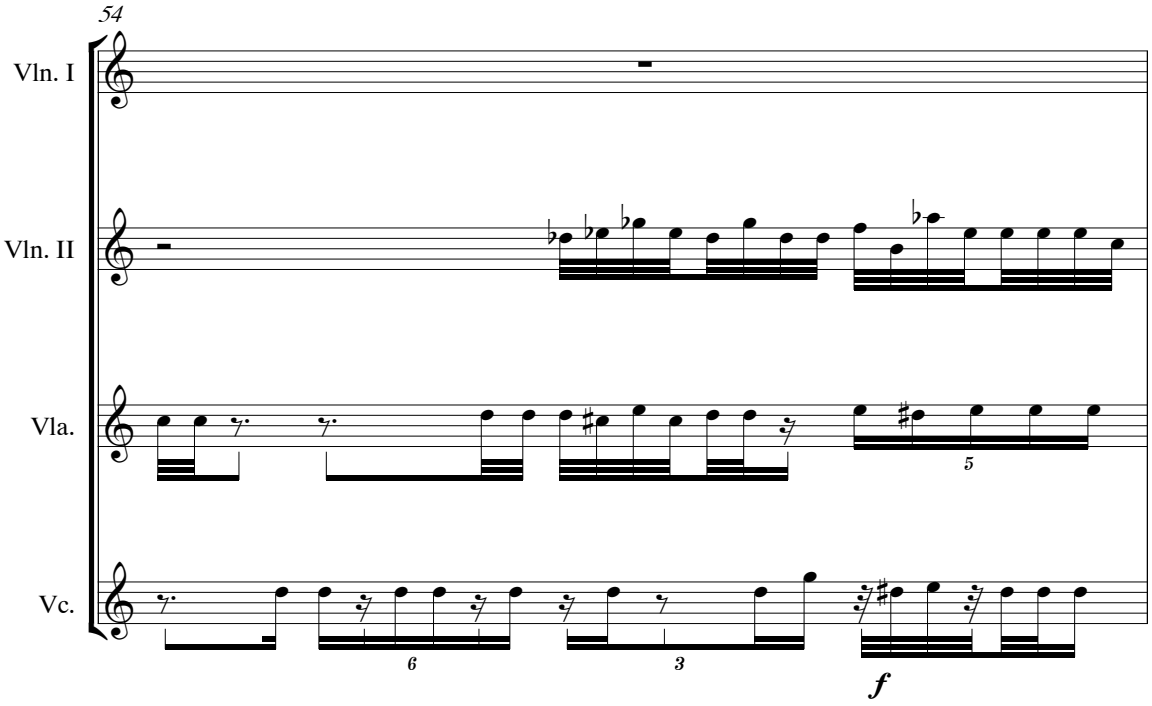

46
Vln. I
Vln. II
Vla.
Vc.
pp
ppp

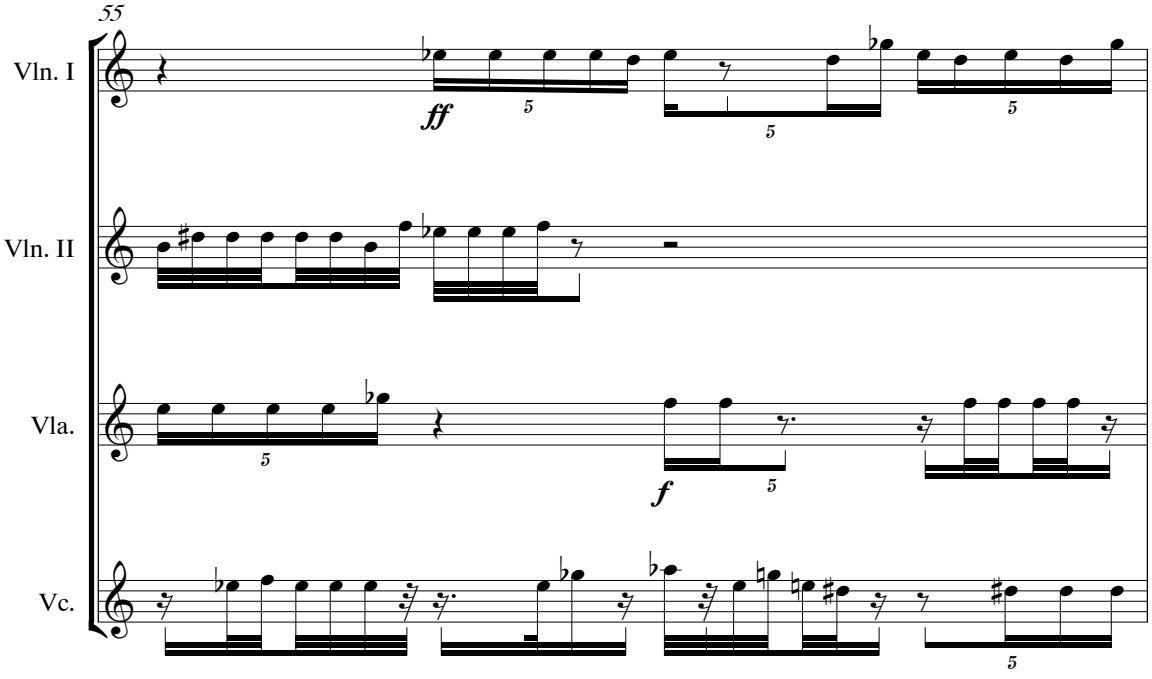

47
Vln. I
Vln. II
Vla.
Vc.
ppp
pp
mf
mf
mf
6
6
6
6
3
3

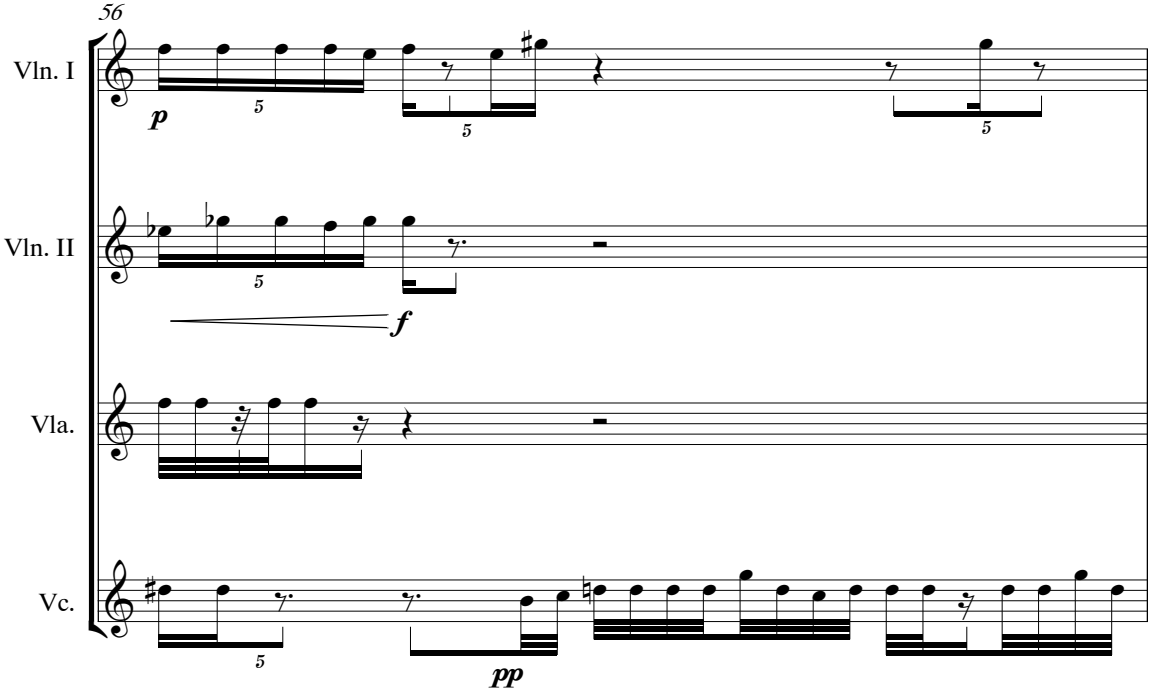

poco rit.
49
Vln. I
Vln. II
Vla.
Vc.
pizz.
pizz.
pizz.
ff
ff
ff
3
5
5
5
3
6
6
6

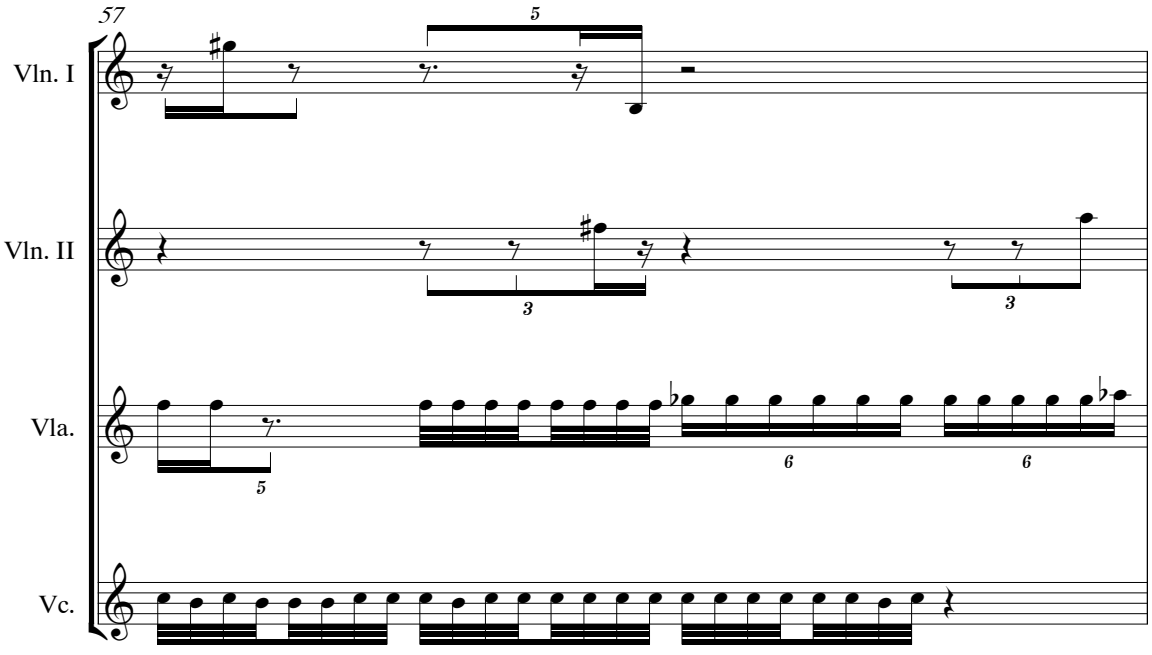

D
tired
♩ = 76
51
Vln. I
Vln. II
Vla.
Vc.
arco, ord.
pizz.
arco
mp
ppp
p
mf

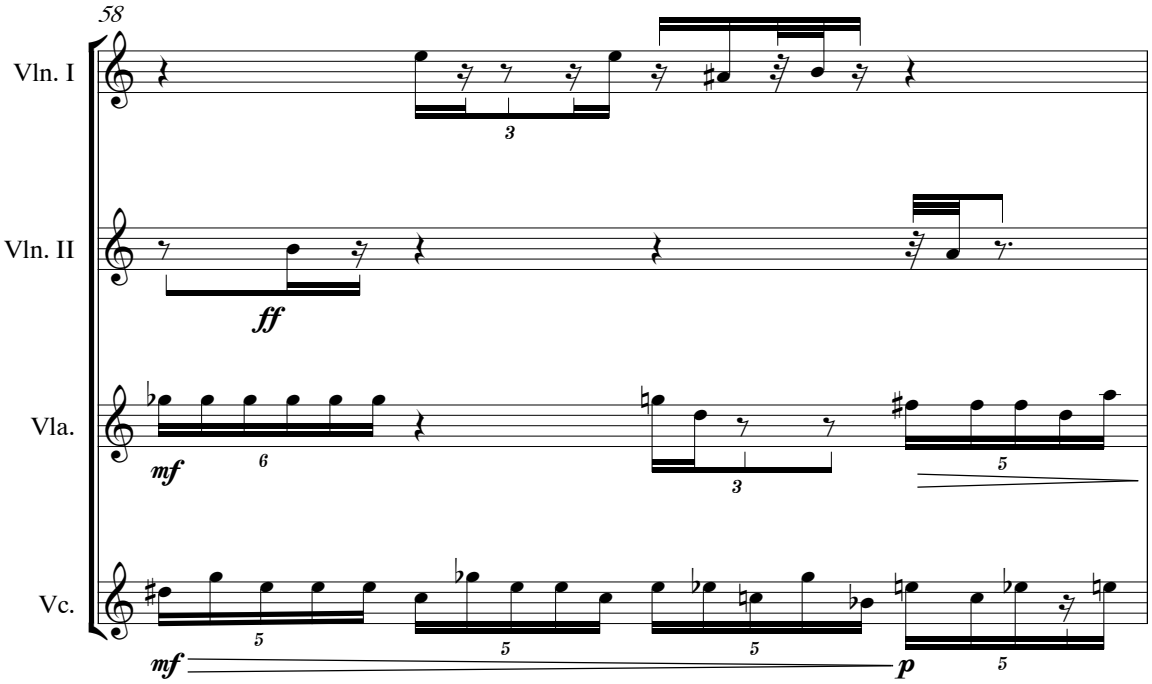

53
Vln. I
Vln. II
Vla.
Vc.
mf

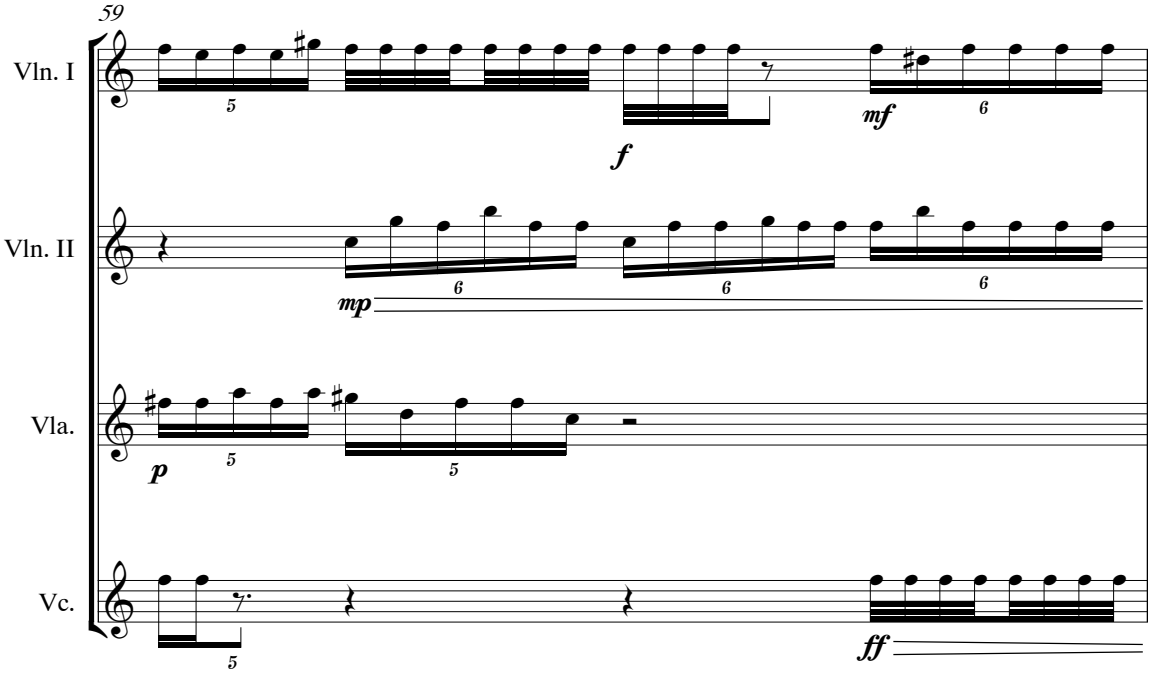

54
Vln. I
Vln. II
Vla.
Vc.
5
6
3
f

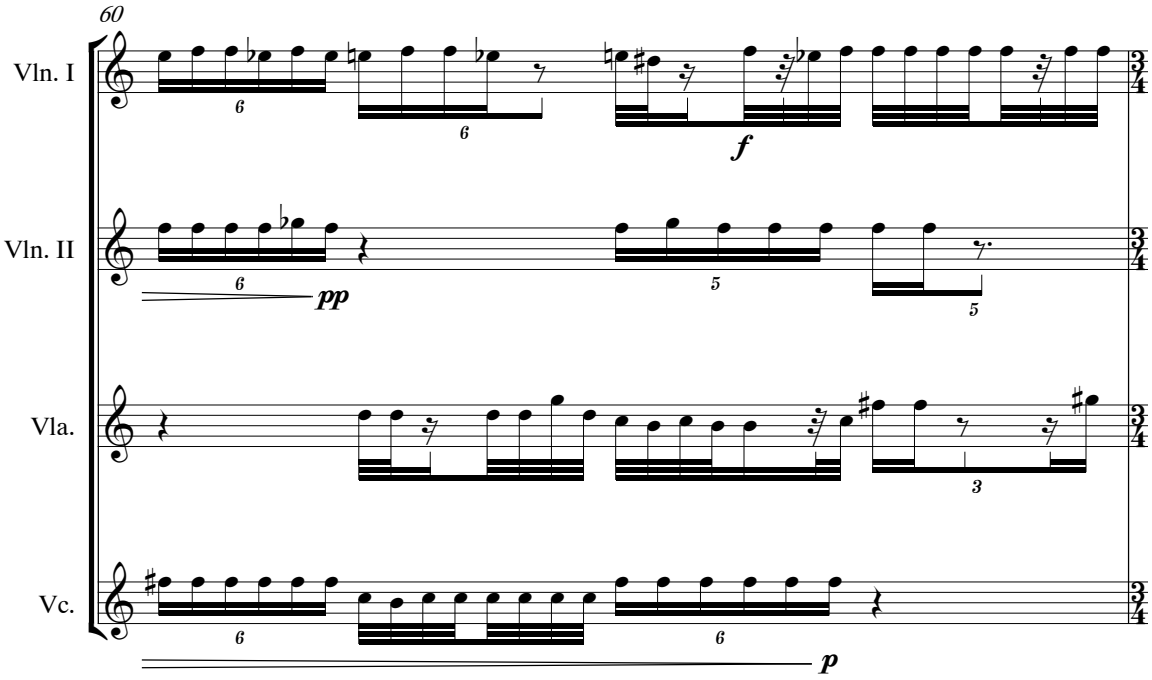

55
Vln. I
Vln. II
Vla.
Vc.
ff
5
f

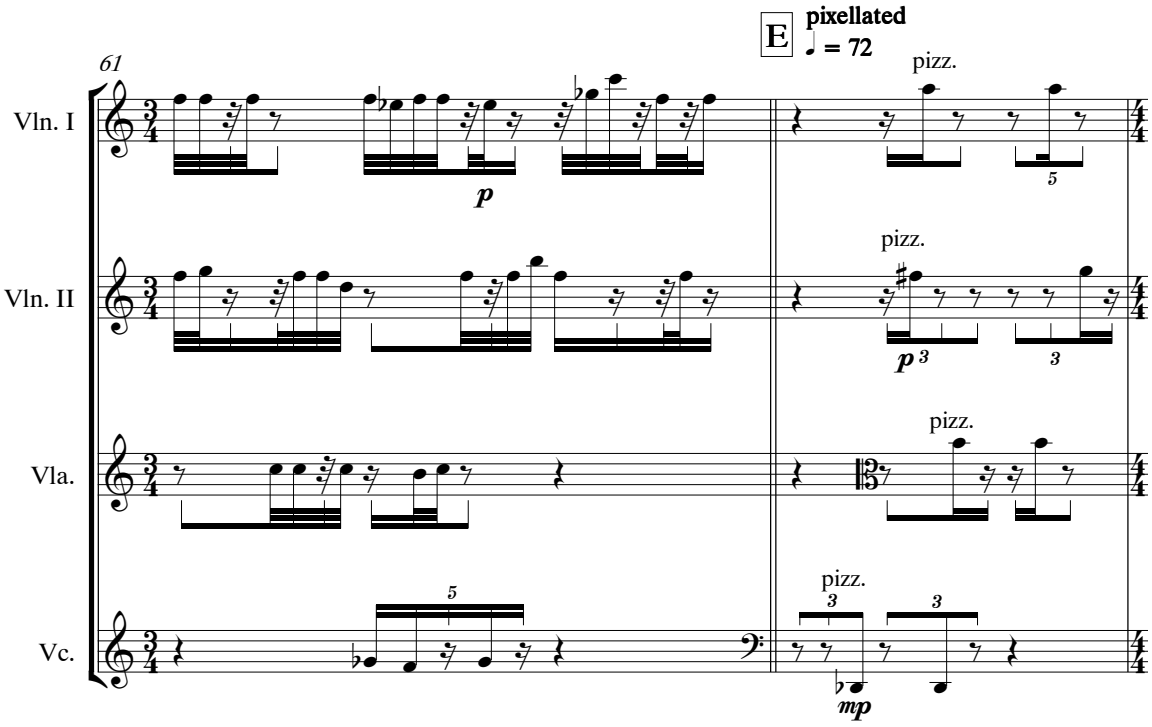

56
Vln. I
Vln. II
Vla.
Vc.
p
f
pp
5

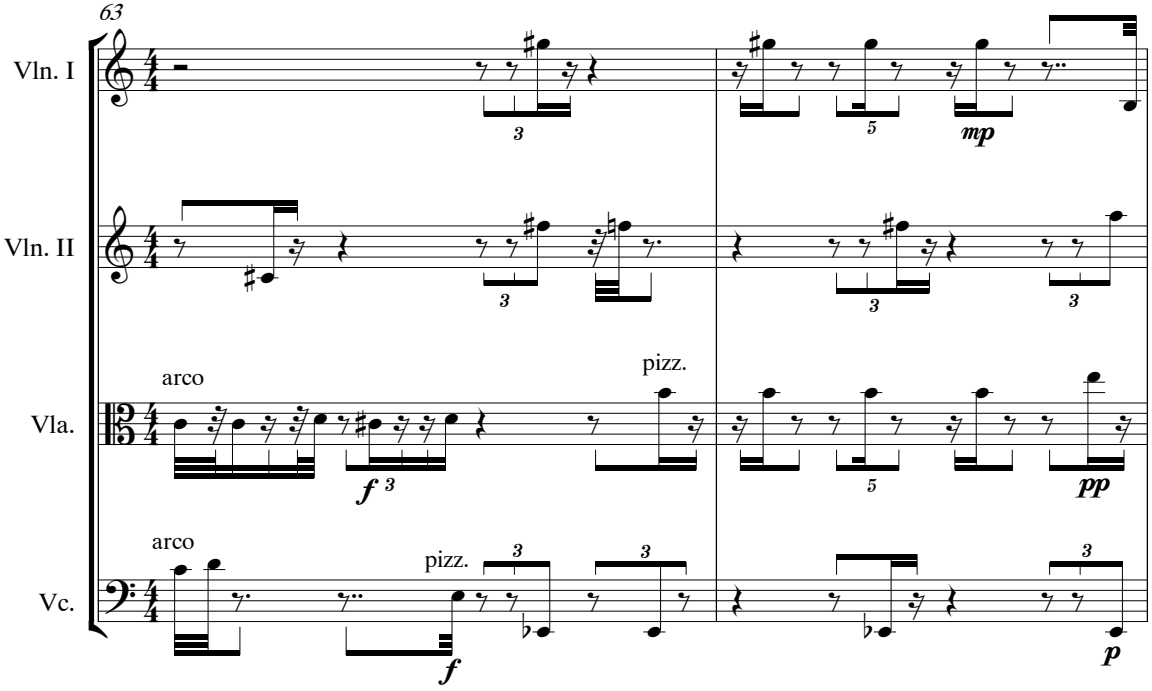

57
Vln. I
Vln. II
Vla.
Vc.
5
3
6

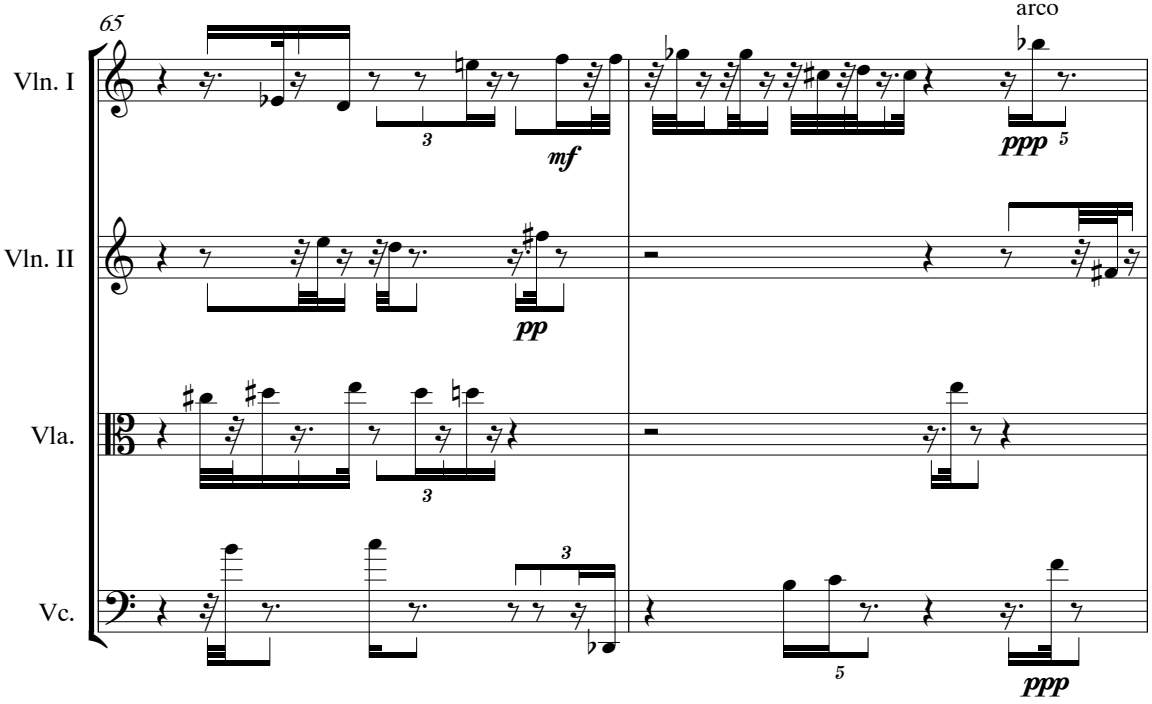

58
Vln. I
Vln. II
Vla.
Vc.
ff
mf
mf
p

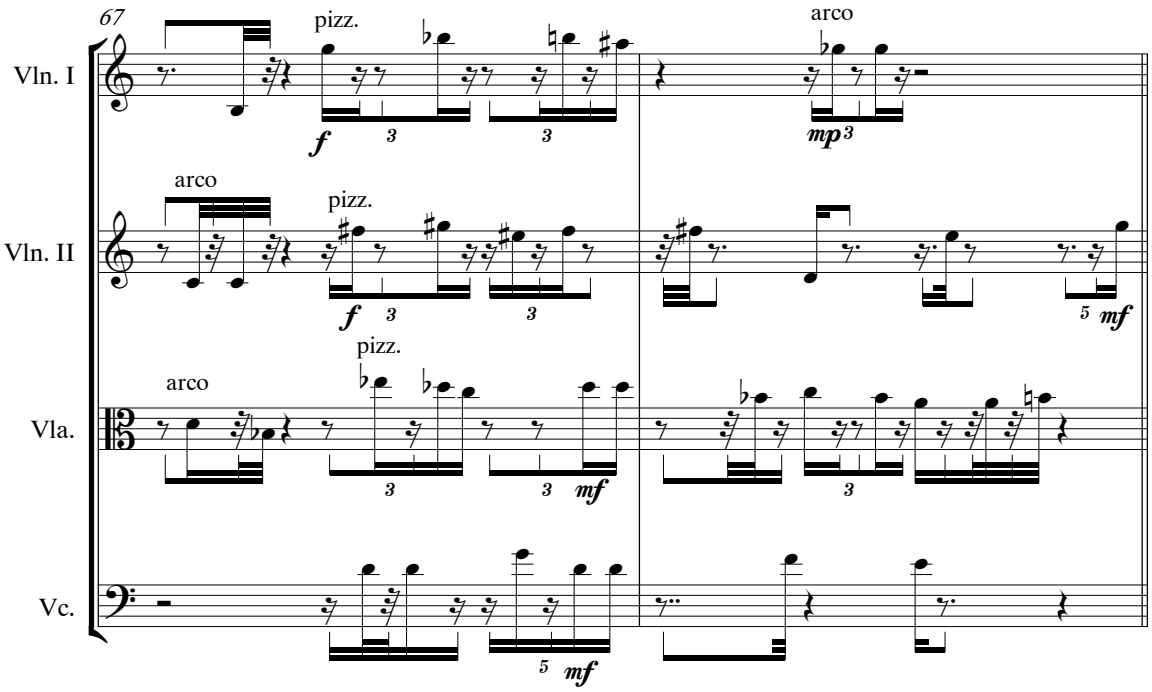

59
Vln. I
Vln. II
Vla.
Vc.
f
mf
mp
p
ff

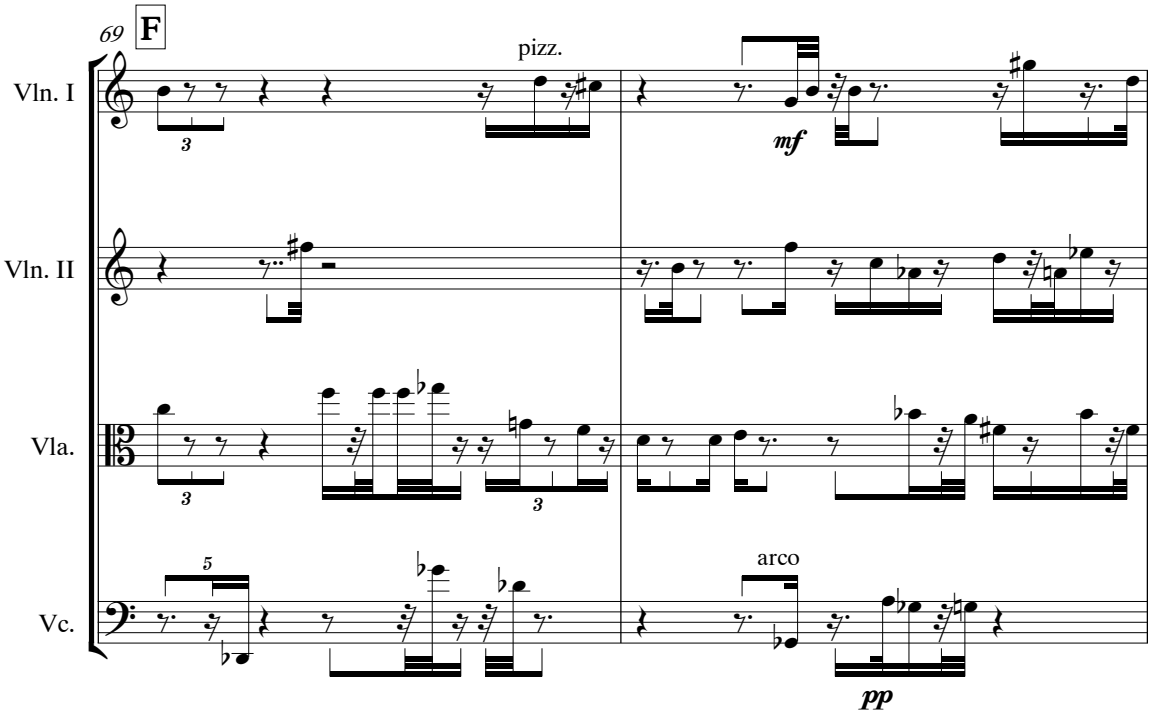

60
Vln. I
Vln. II
Vla.
Vc.
f
pp
p

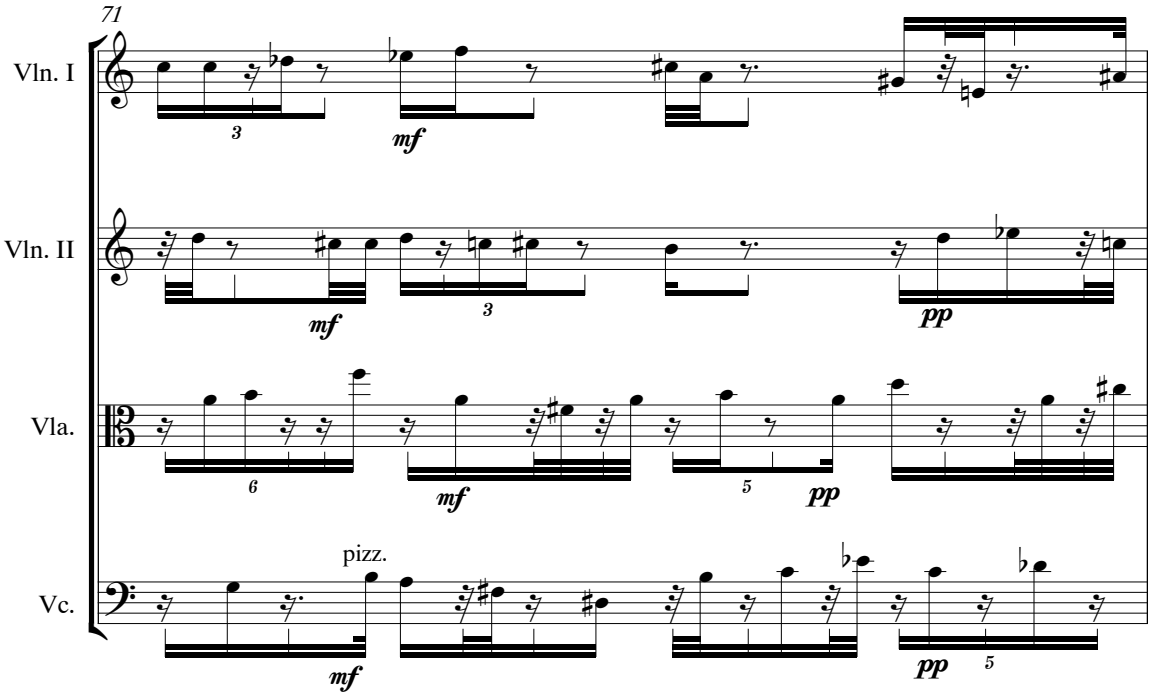

E
pixellated
♩ = 72
61
Vln. I
Vln. II
Vla.
Vc.
p
pizz.
mp

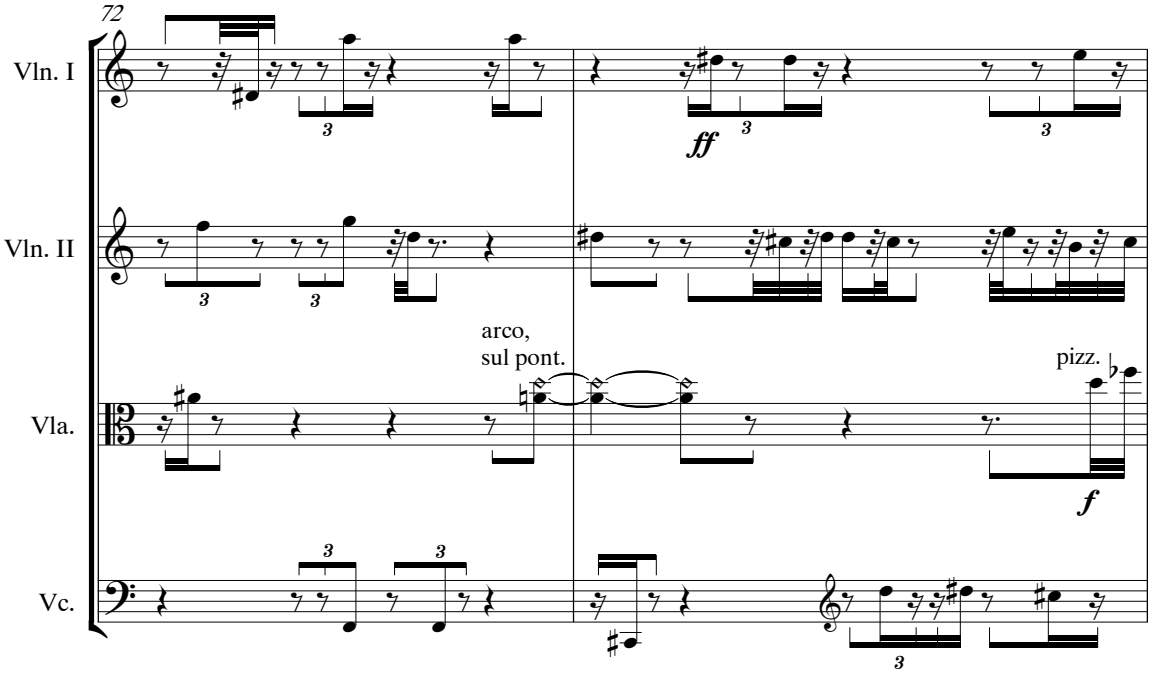

63
Vln. I
Vln. II
Vla.
Vc.
arco
pizz.
arco
pizz.
mp
f
pp
f
p

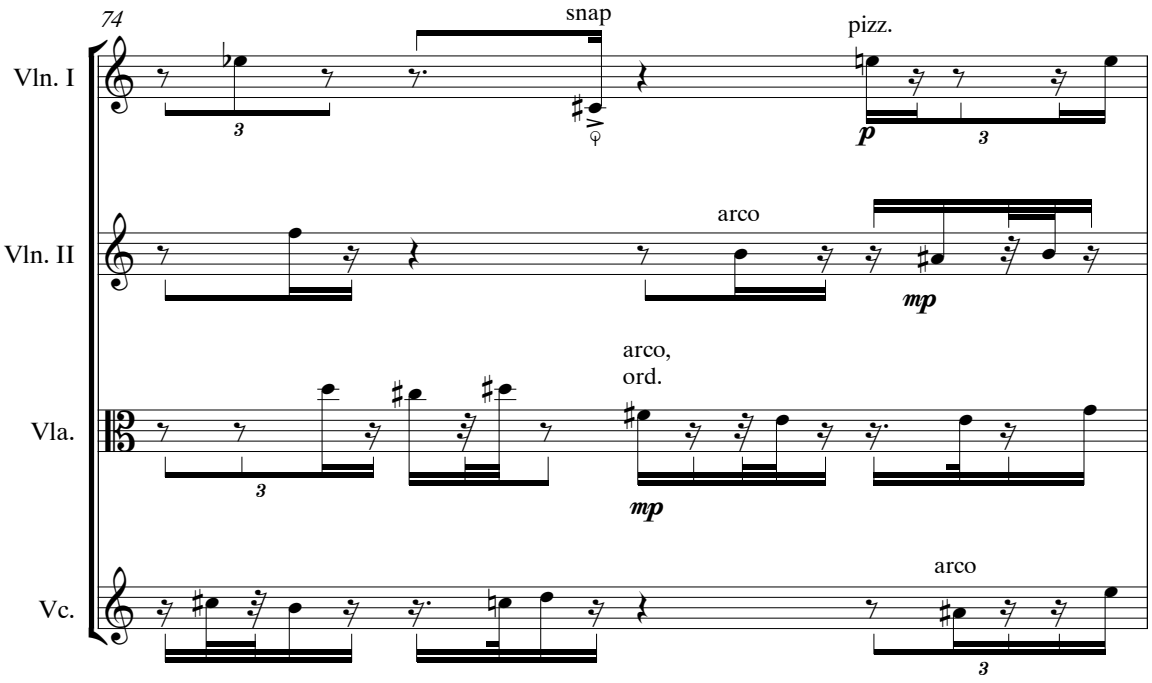

65
Vln. I
Vln. II
Vla.
Vc.
arco
mf
pp
ppp
ppp

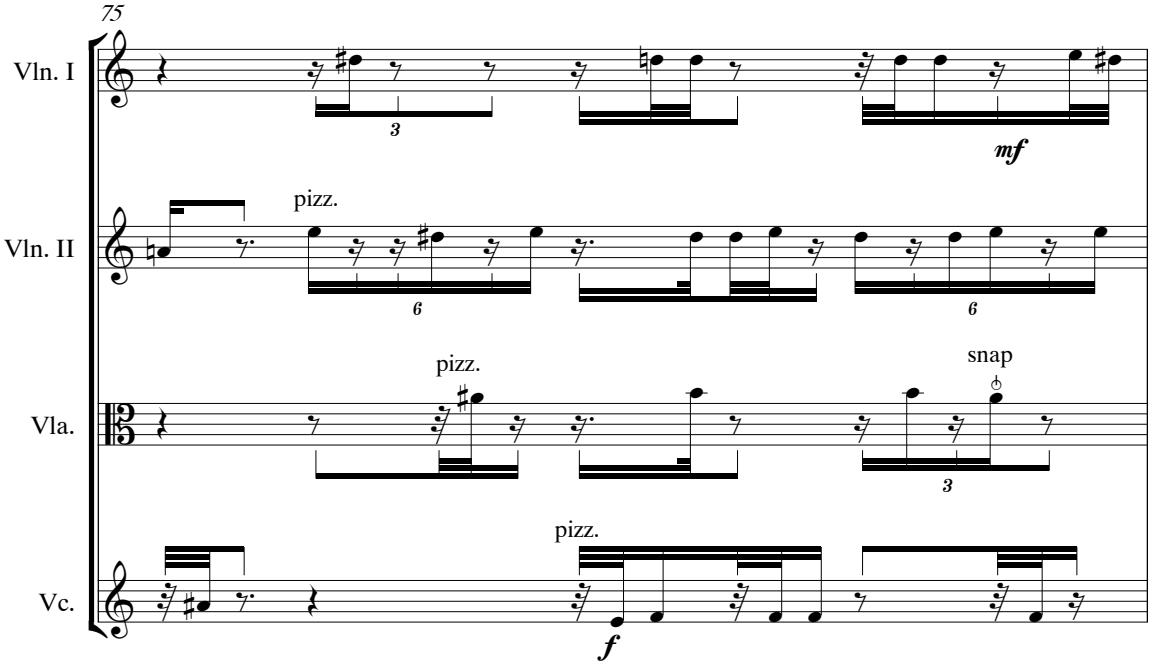

67
Vln. I
Vln. II
Vla.
Vc.
pizz.
arco
f
mp
mf

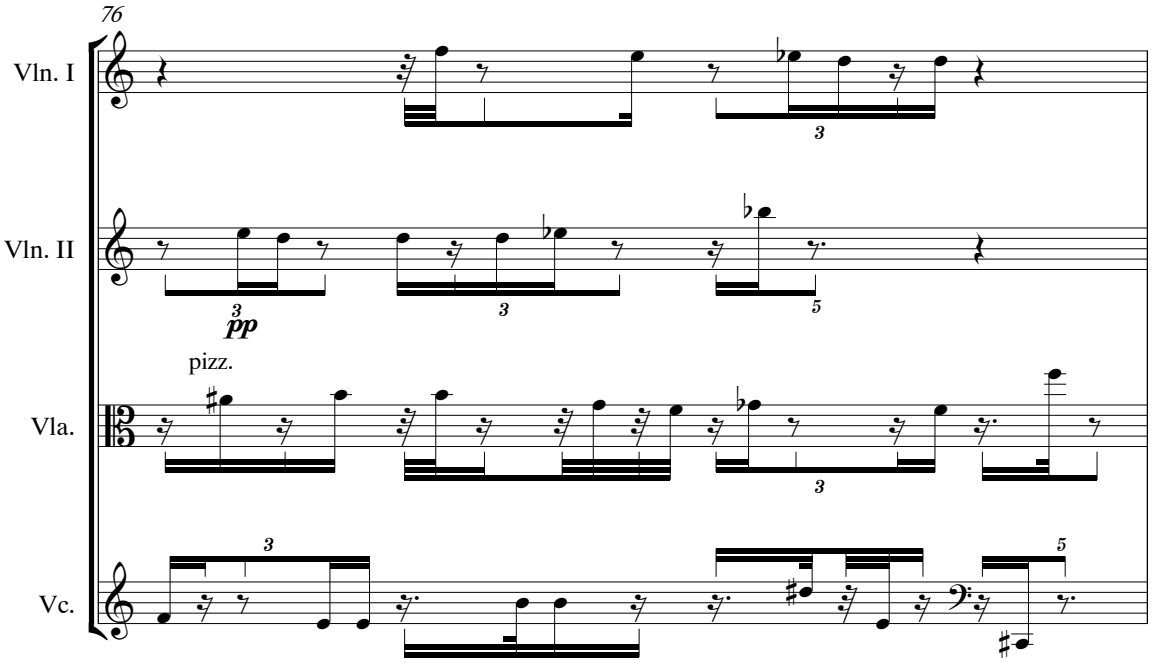

69
F
Vln. I
Vln. II
Vla.
Vc.
pizz.
arco
mf
pp

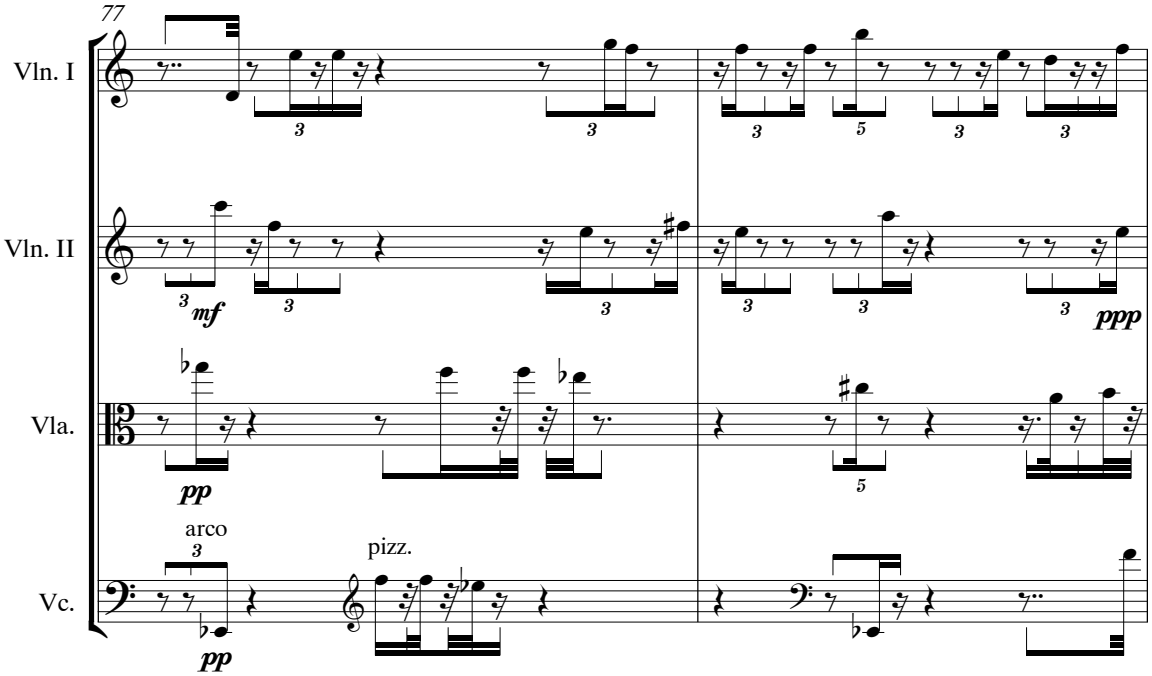

71
Vln. I
Vln. II
Vla.
Vc.
pizz.
mf
pp

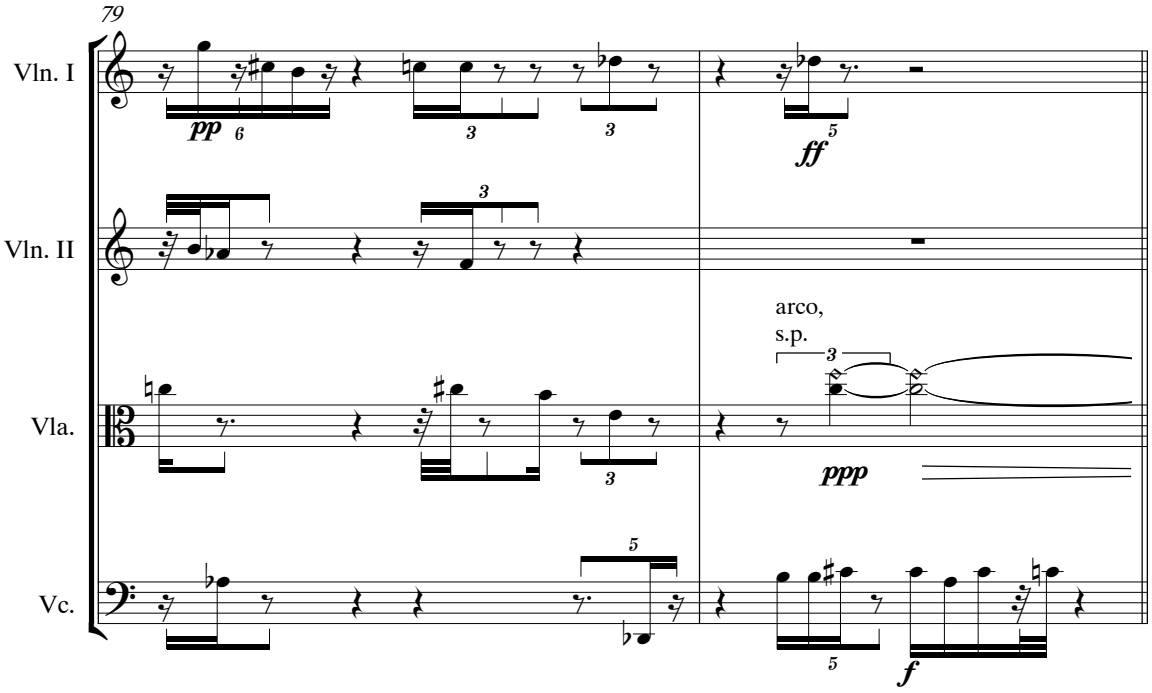

72
Vln. I
Vln. II
Vla.
Vc.
arco,
sul pont.
pizz.
ff
f

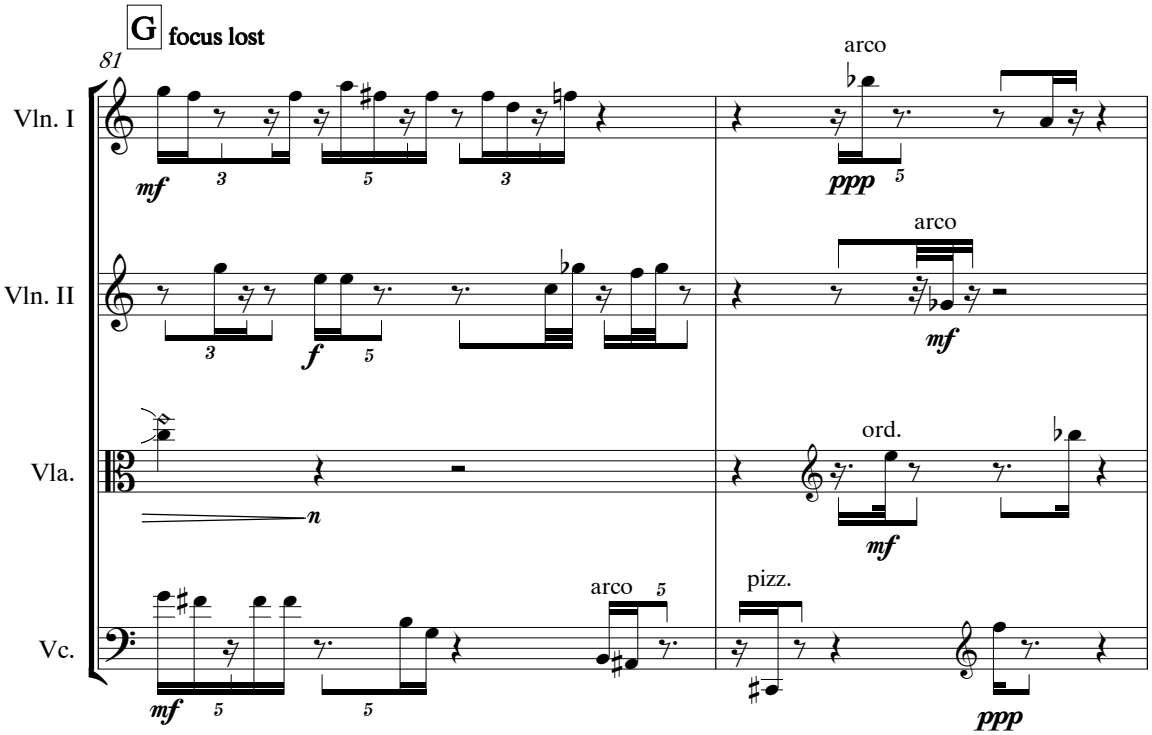

74
Vln. I
Vln. II
Vla.
Vc.
snap
pizz.
arco
arco,
ord.
arco
p
mp
mp

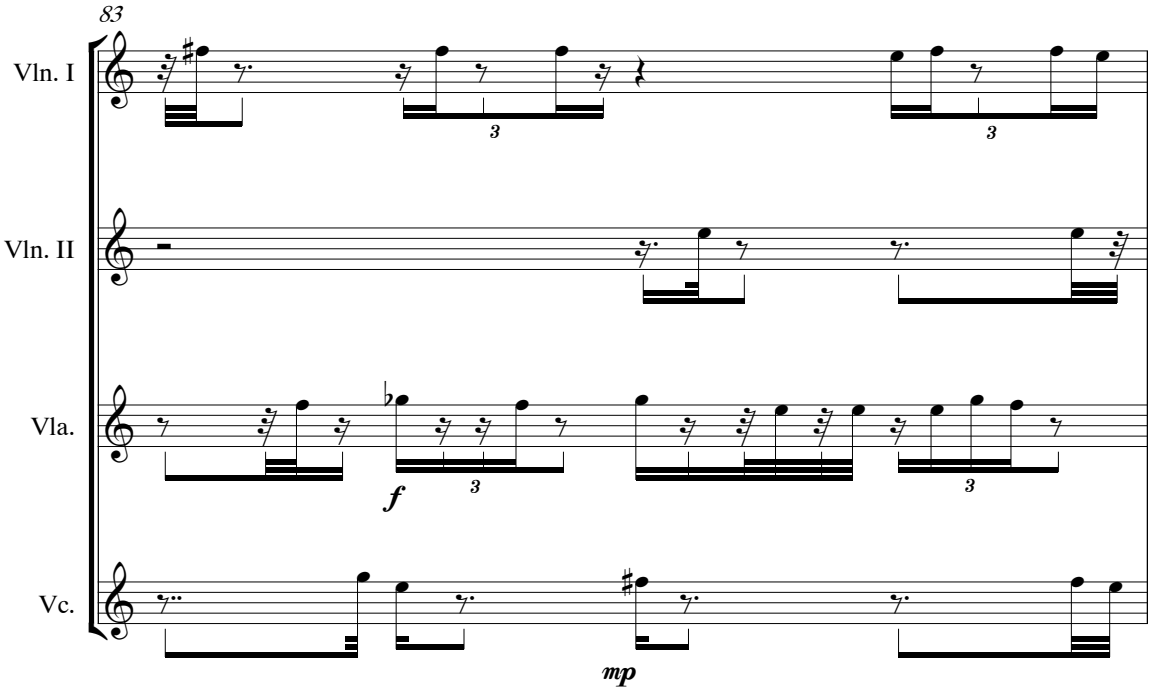

75
Vln. I
Vln. II
Vla.
Vc.
pizz.
pizz.
pizz.
snap
mf
f

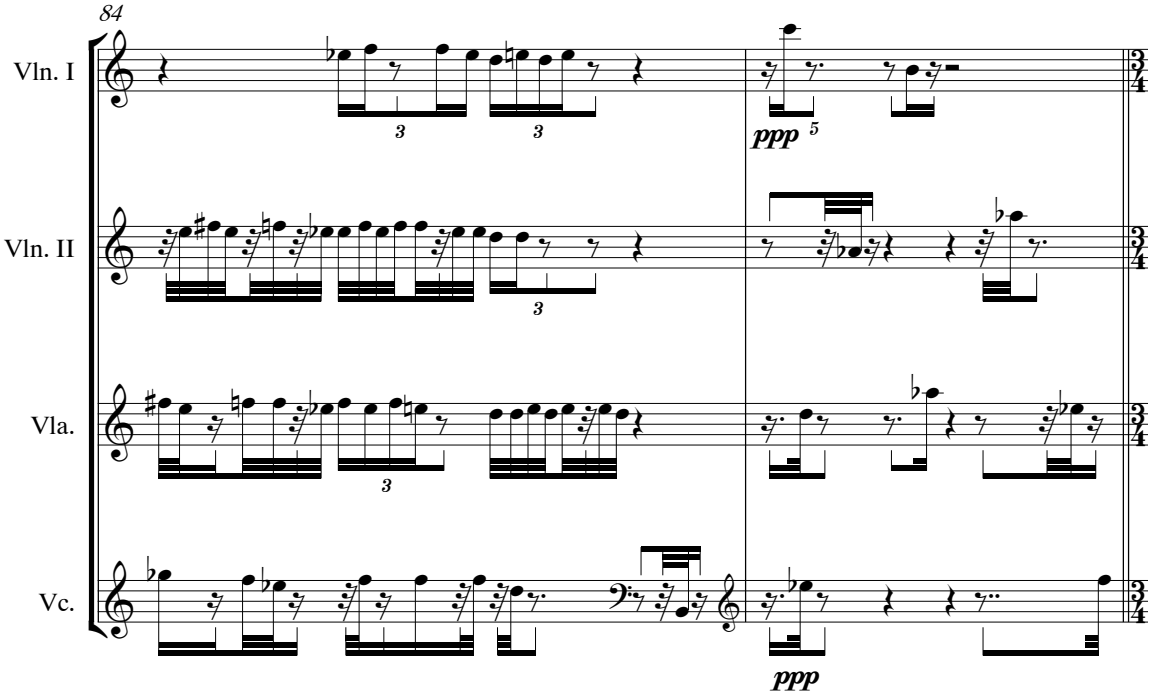

76
Vln. I
Vln. II
pp
pizz.
Vla.
Vc.

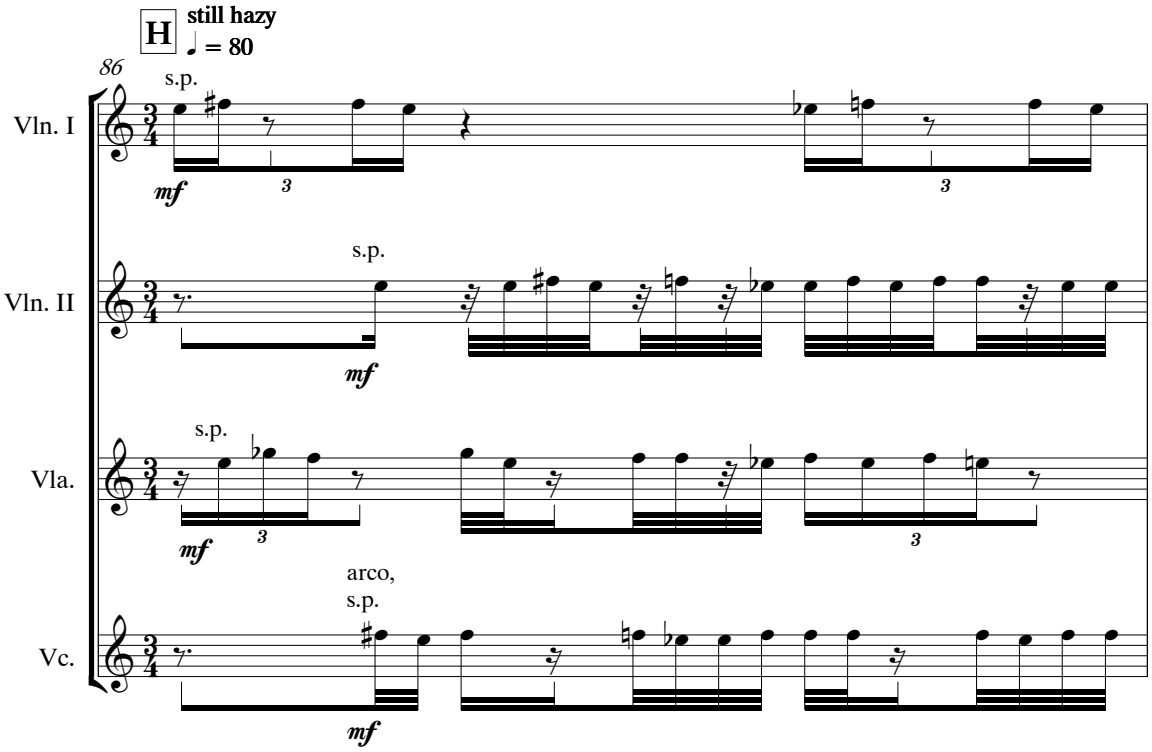

77
Vln. I
Vln. II
mf
ppp
Vla.
pp
arco
pizz.
Vc.
pp

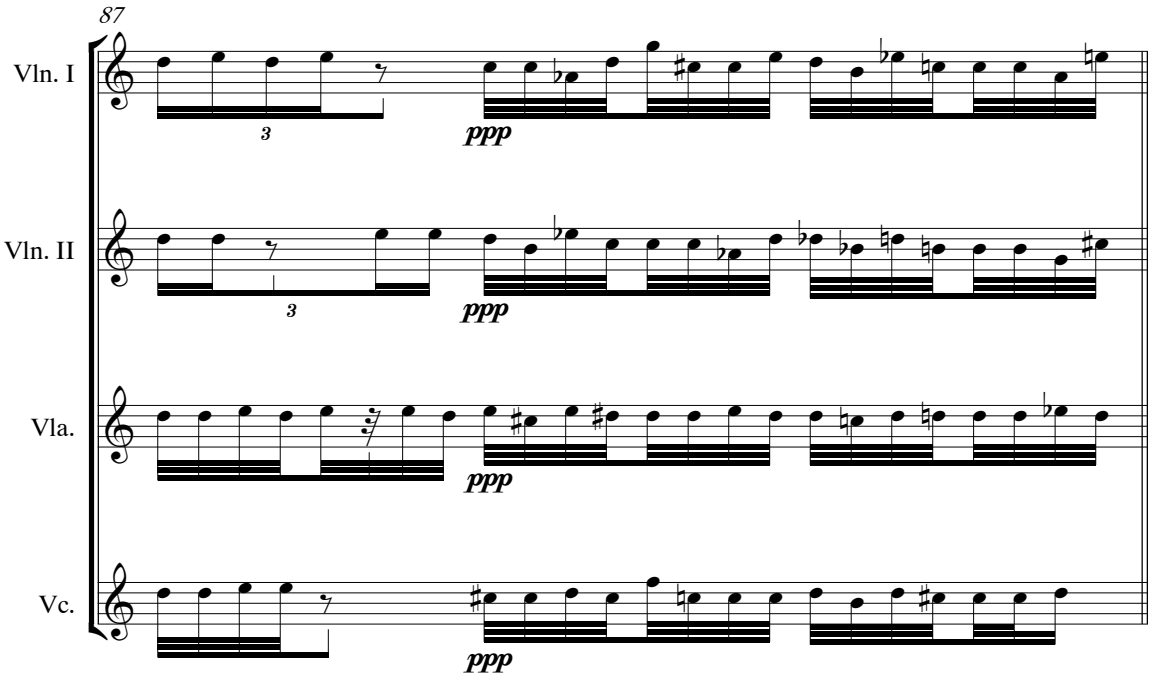

79
Vln. I
Vln. II
Vla.
Vc.
pp
ff
arco,
s.p.
ppp
f

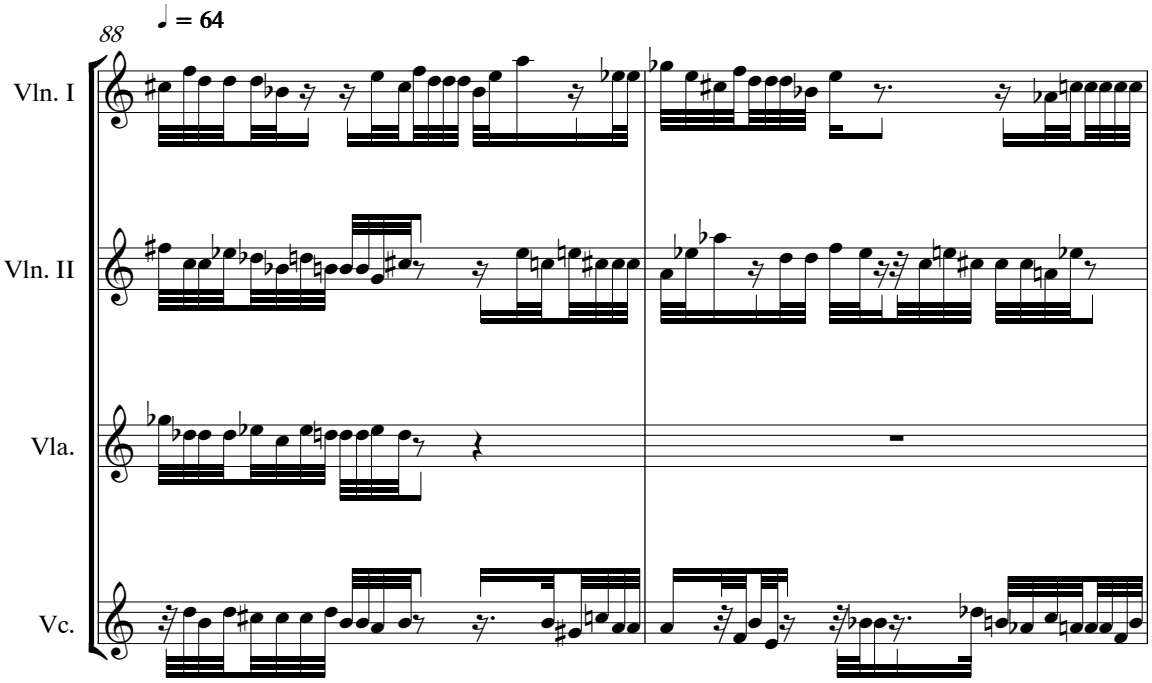

G
focus lost
81
Vln. I
Vln. II
Vla.
Vc.
mf
ppp
arco
f
n
ord.
pizz.

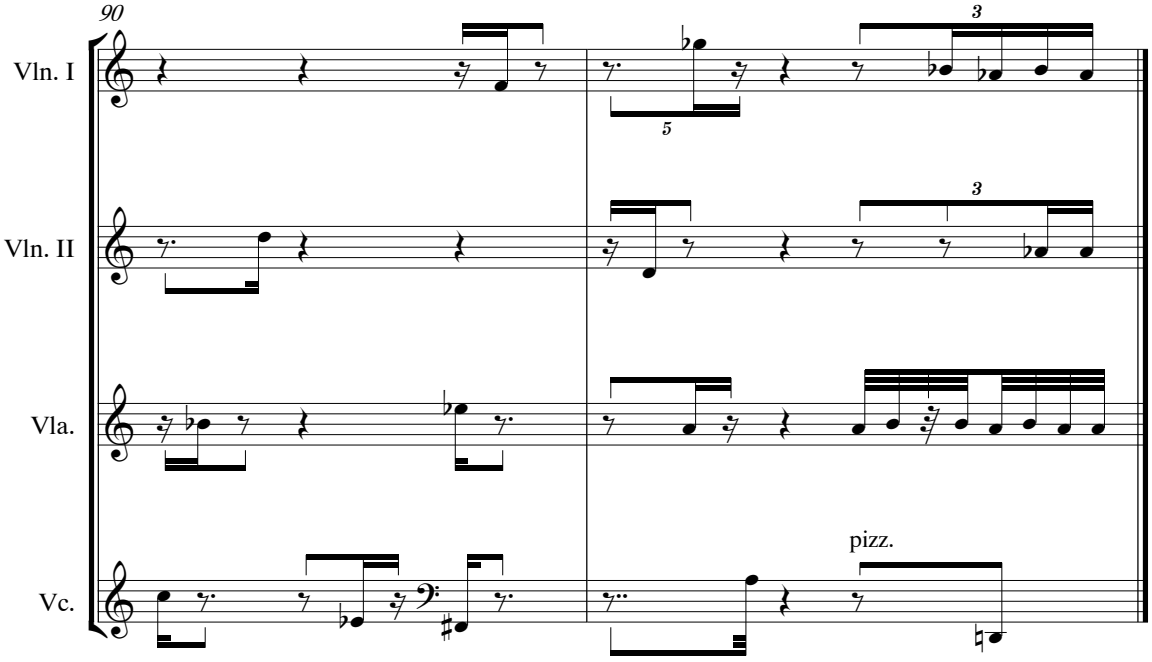

83
Vln. I
Vln. II
Vla.
Vc.
f
mp


84
Vln. I
Vln. II
Vla.
Vc.
ppp
ppp

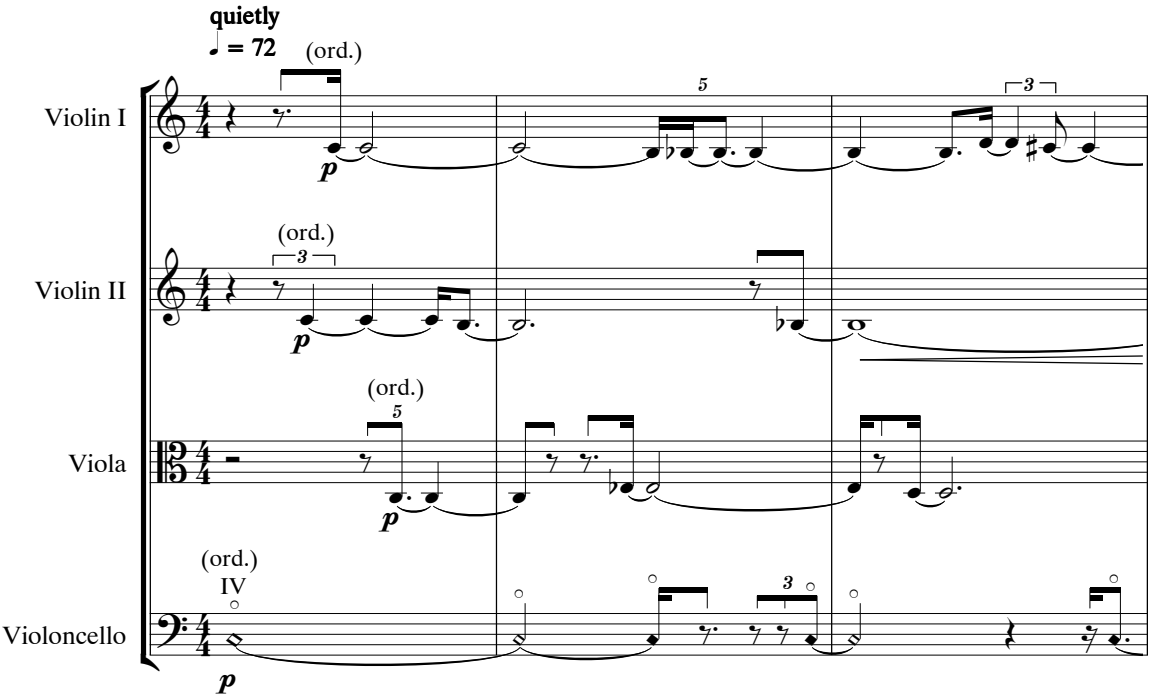

H
still hazy
♩ = 80
86
Vln. I
Vln. II
Vla.
Vc.
s.p.
arco,
s.p.
mf
3

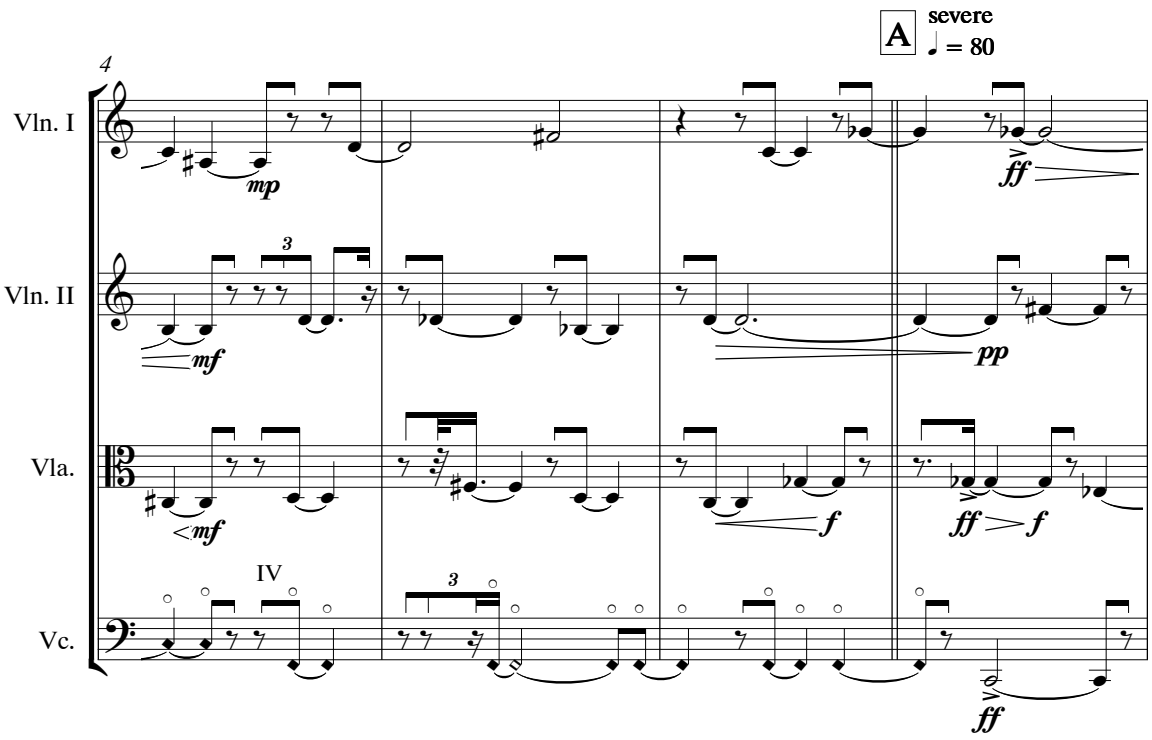

87
Vln. I
Vln. II
Vla.
Vc.
3
ppp

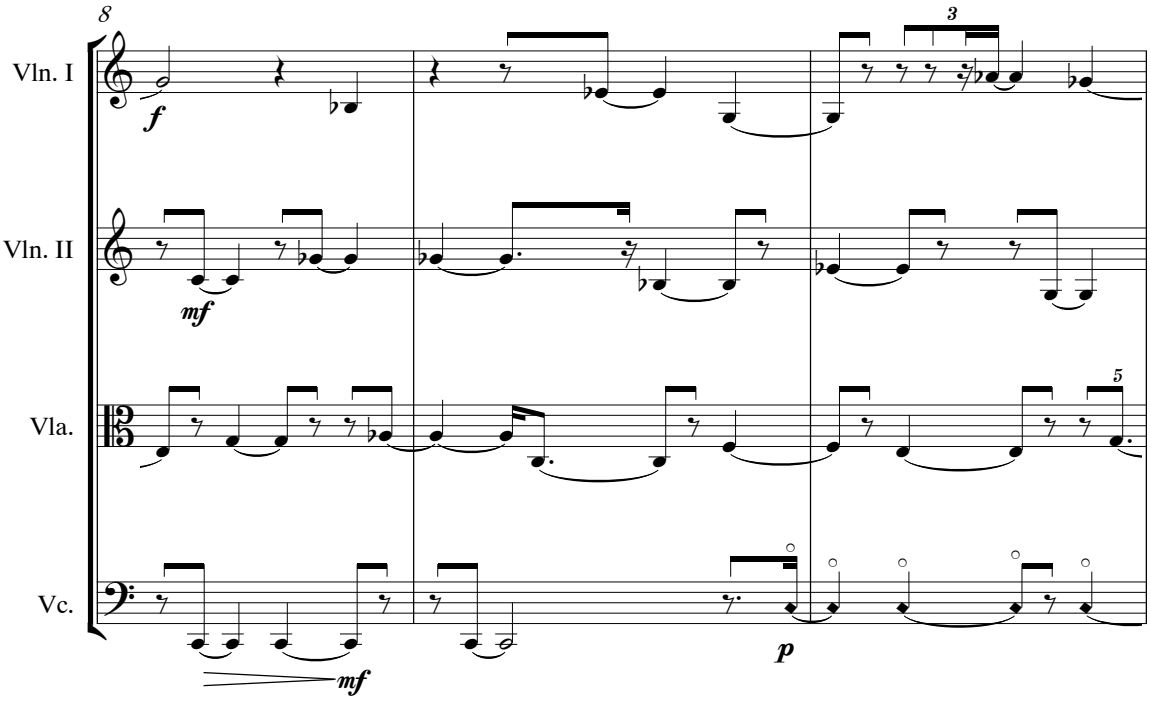

88
♩ = 64
Vln. I
Vln. II
Vla.
Vc.

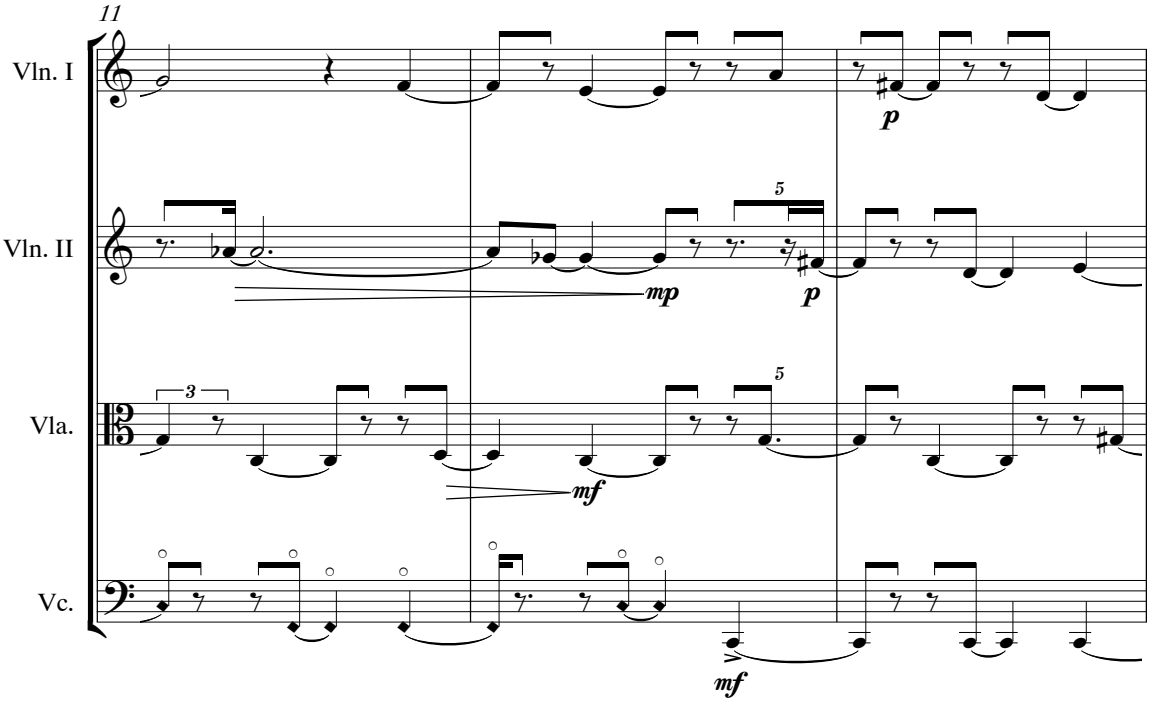

90
Vln. I
Vln. II
Vla.
Vc.
3
5
3
pizz.

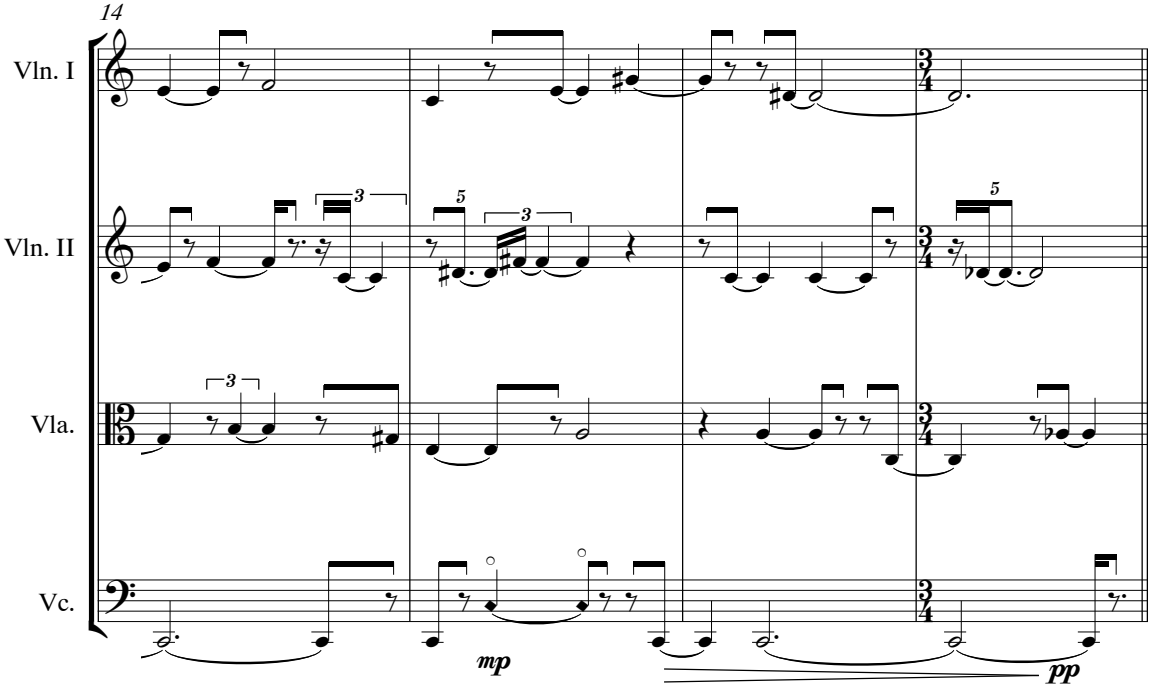
III.

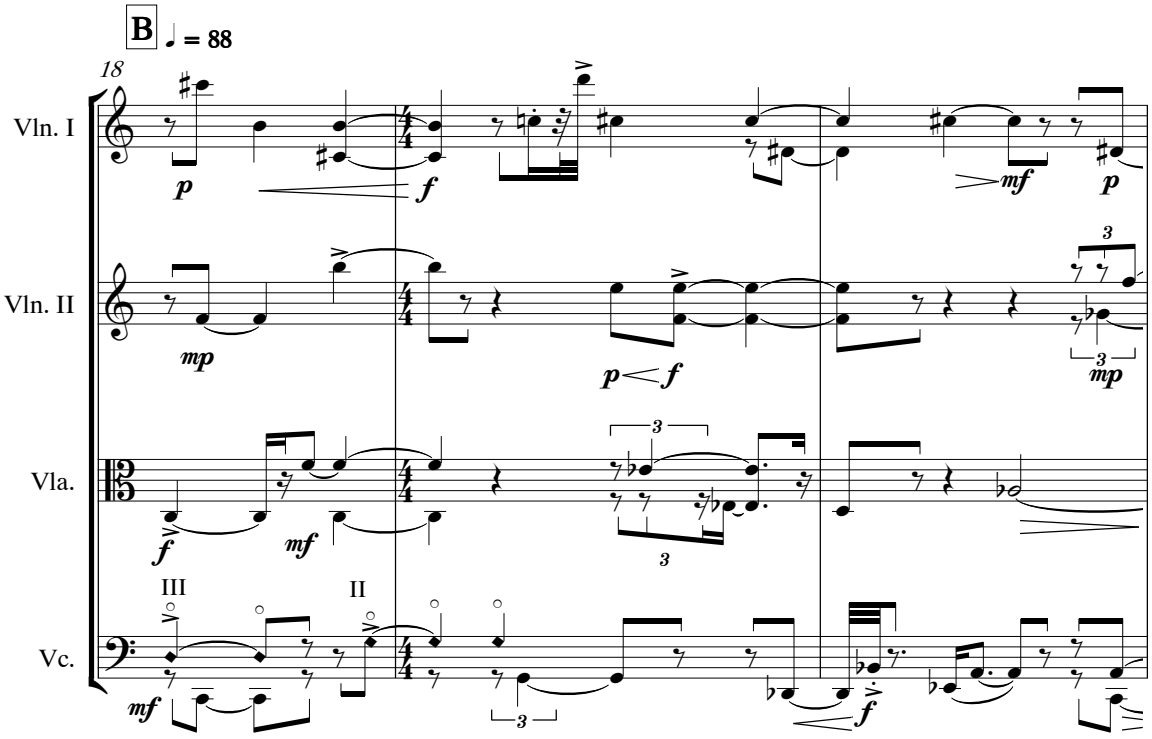

quietly
♩ = 72
(ord.)
Violin I
Violin II
Viola
Violoncello
IV
p

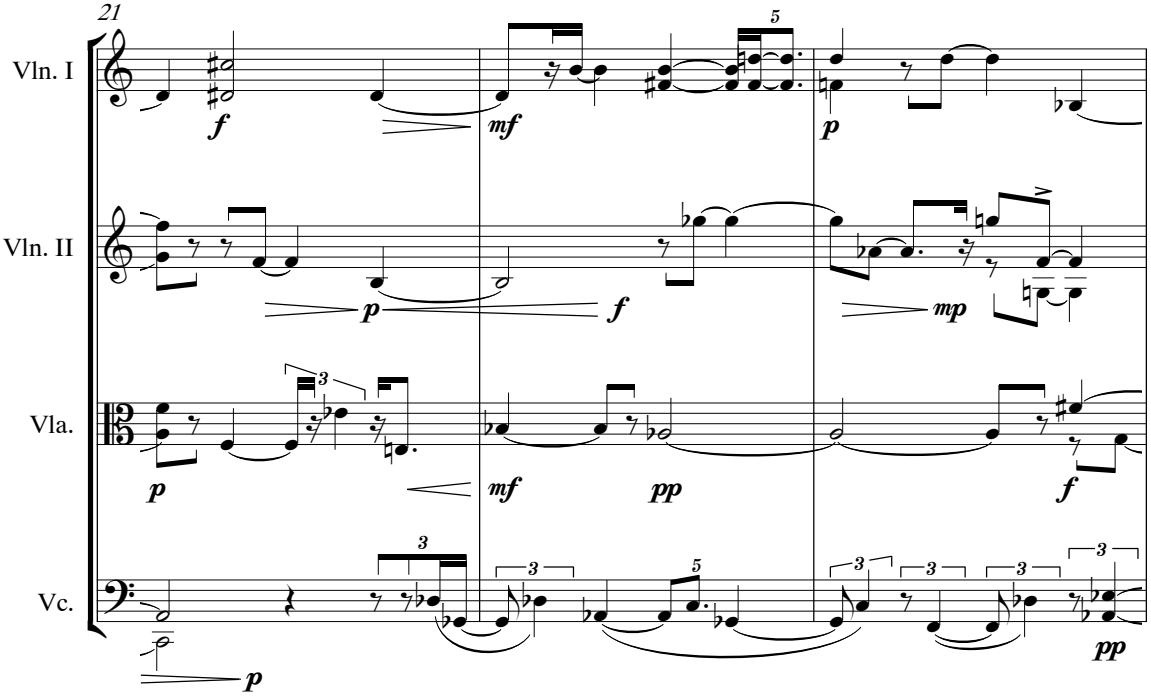

A
severe
♩ = 80
Vln. I
Vln. II
Vla.
Vc.
IV
mp
mf
pp
f
ff

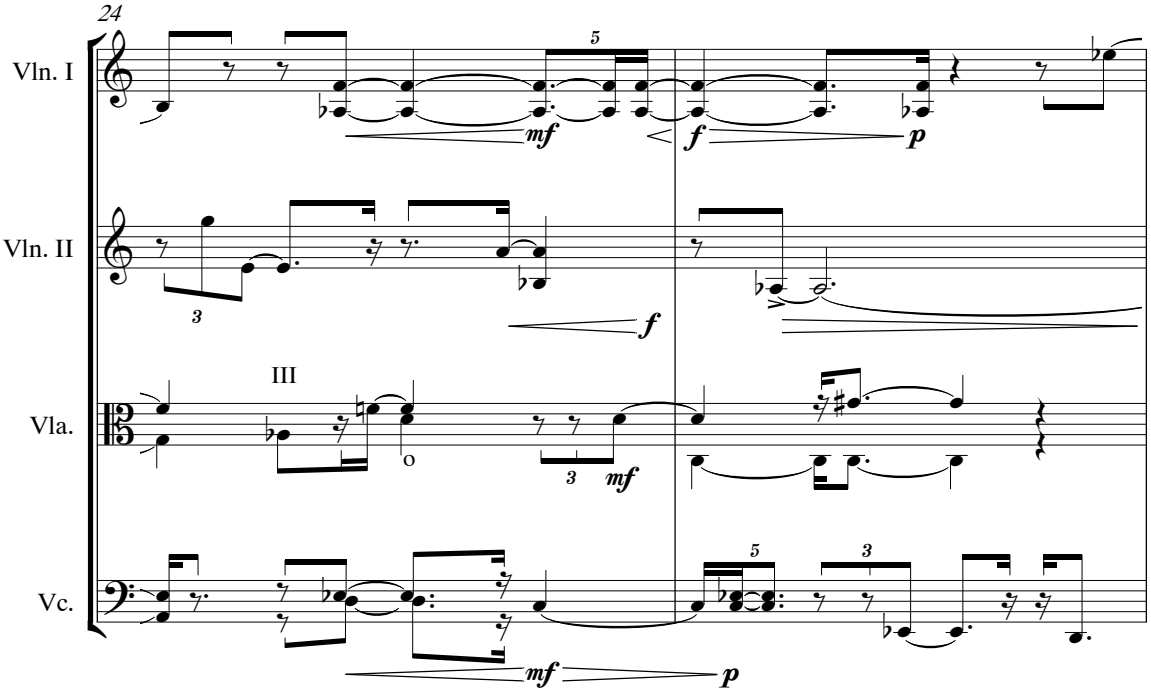

8
Vln. I
Vln. II
Vla.
Vc.
f
mf
mf
p
3
5

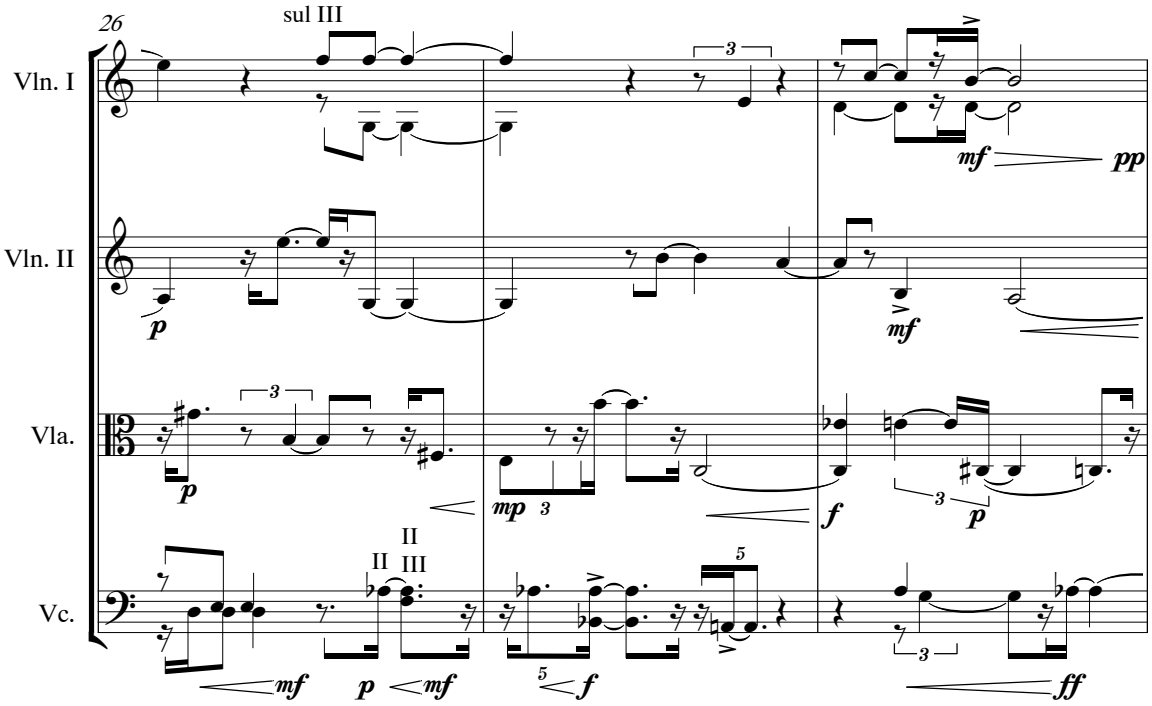

11
Vln. I
Vln. II
Vla.
Vc.
p
mp
p
mf
mf
3
5
5

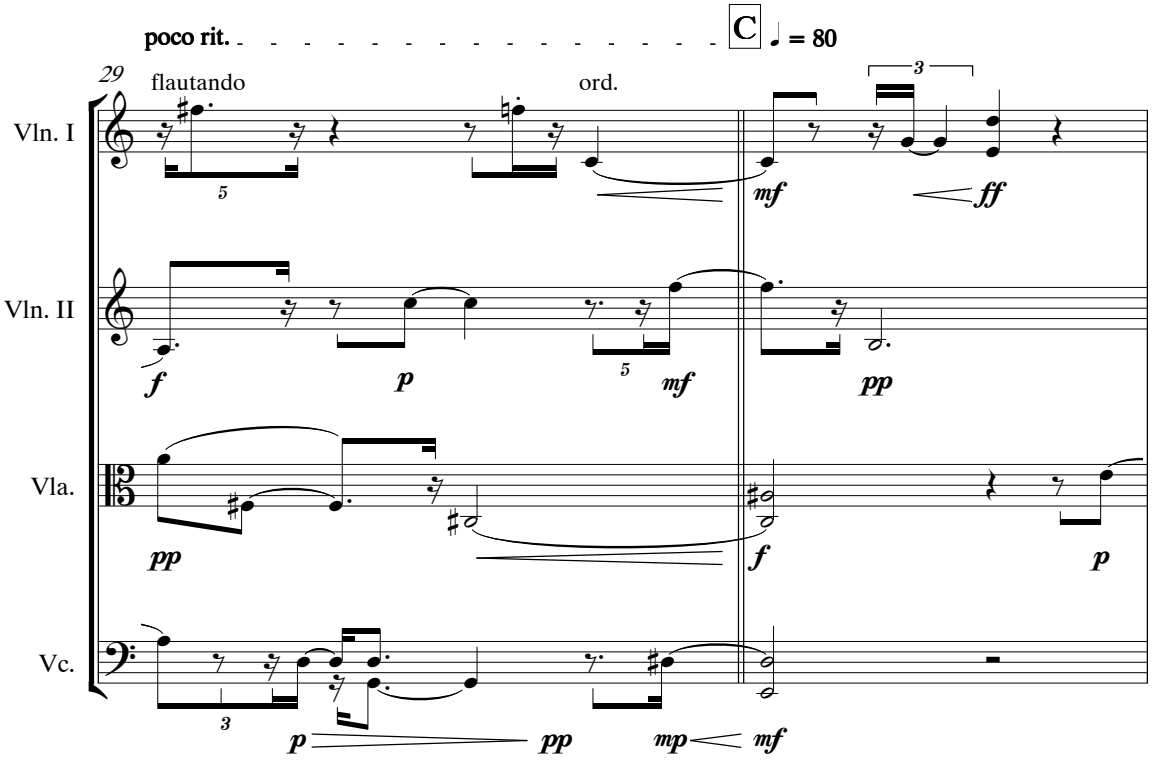

14
Vln. I
Vln. II
Vla.
Vc.
mp
pp

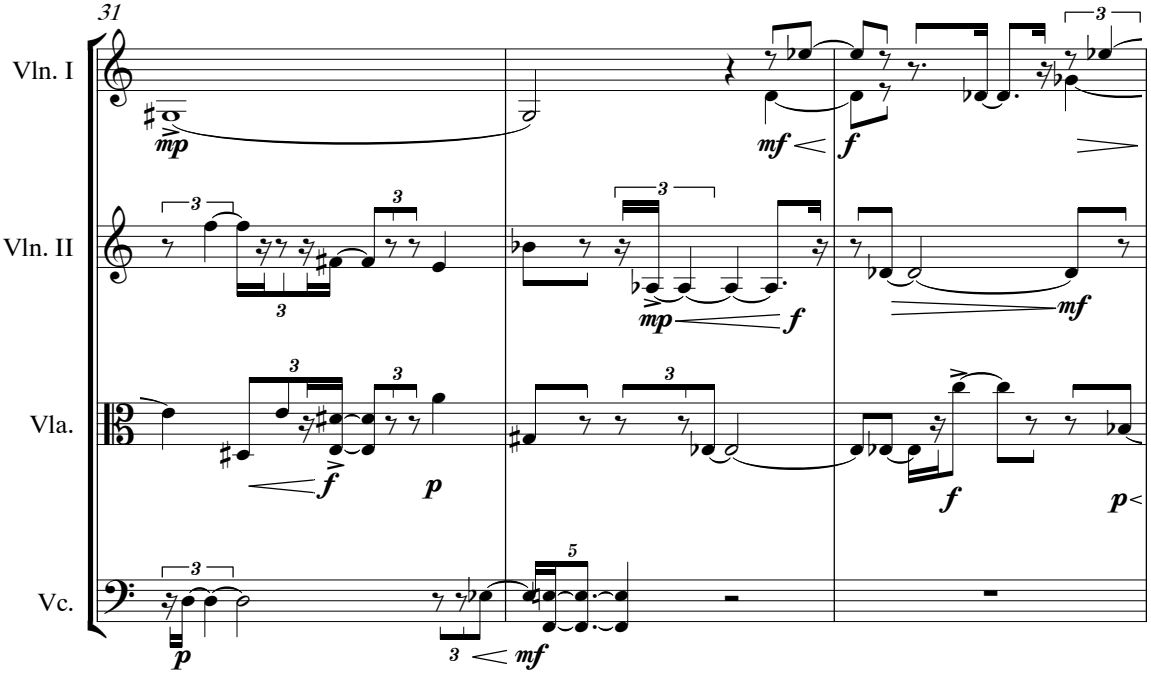

B
♩ = 88
18
Vln. I
Vln. II
Vla.
Vc.
III
II

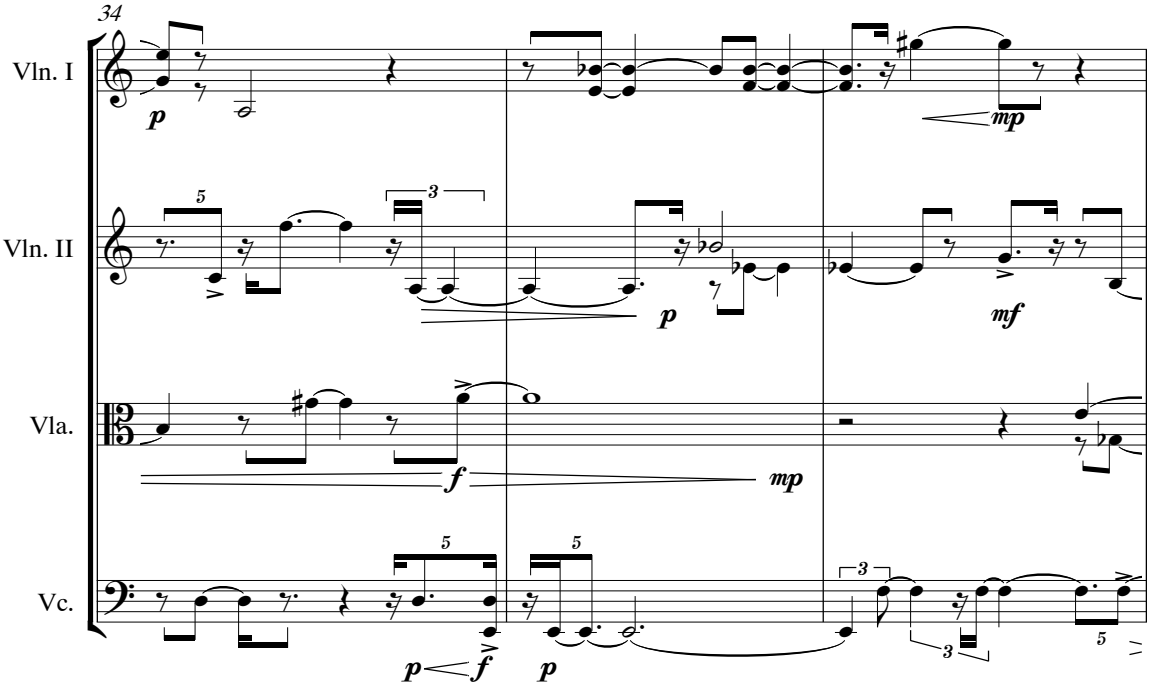

21
Vln. I
Vln. II
Vla.
Vc.
f
mf
p
p
f
mp
p
mf
pp
f
p
pp

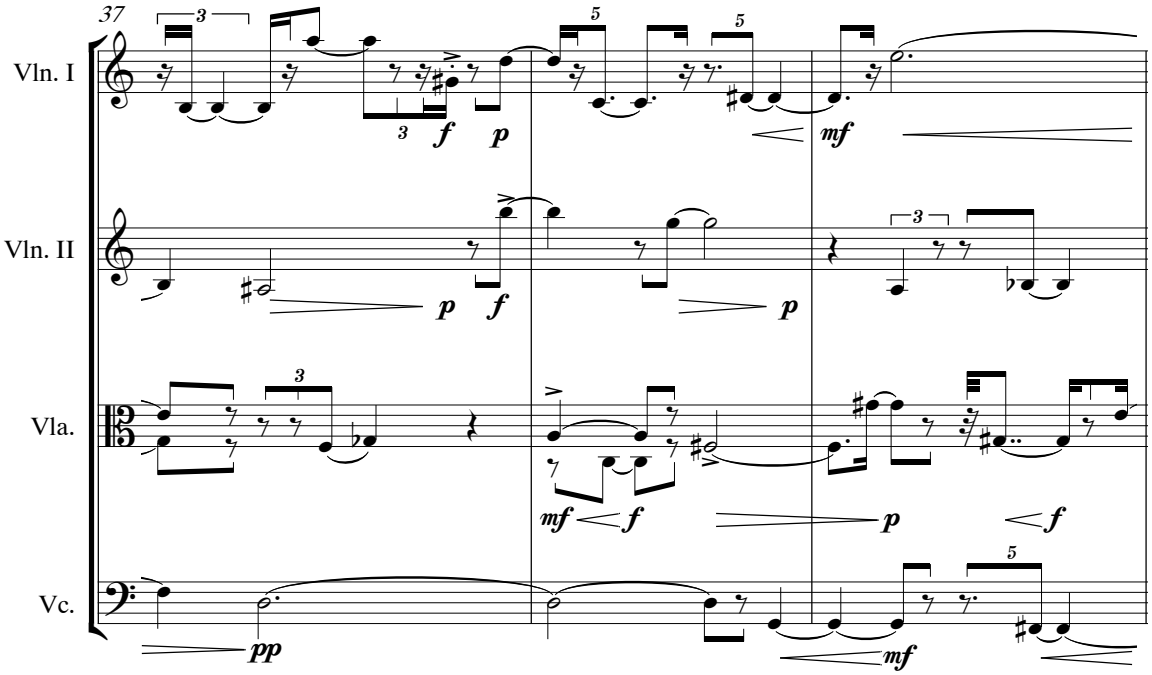

24
Vln. I
Vln. II
Vla.
Vc.
III
mf
f
p
f
mf
mf
p

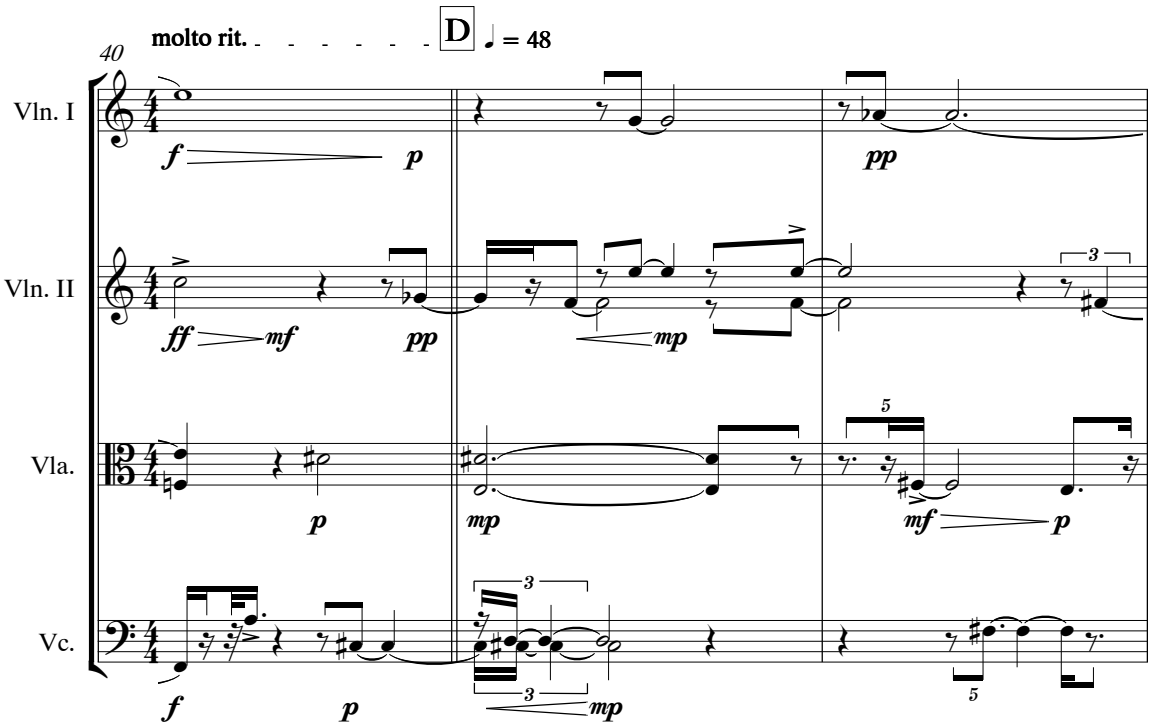

26
sul III
Vln. I
Vln. II
Vla.
Vc.
II
II III
mf
pp
p
mf
p
mf
mp
f
p
mf
p
mf
f
ff

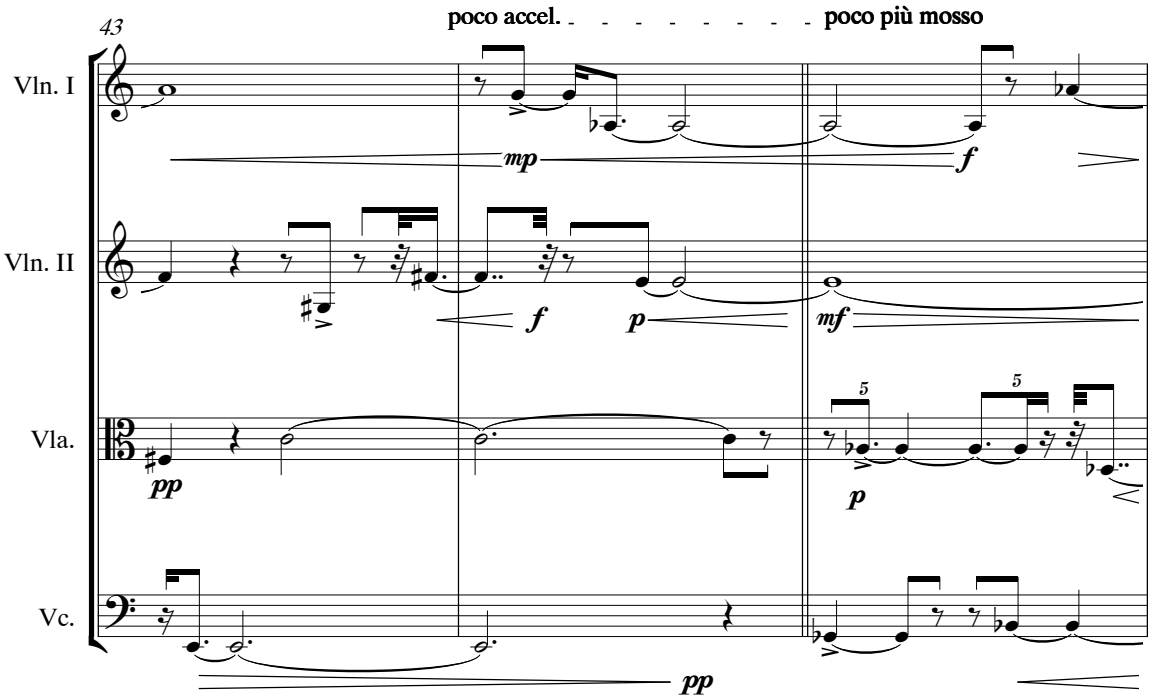

poco rit.
C
♩ = 80
29
flautando
ord.
Vln. I
Vln. II
Vla.
Vc.
mf
ff
f
p
mf
pp
pp
f
p
p
pp
mp
mf

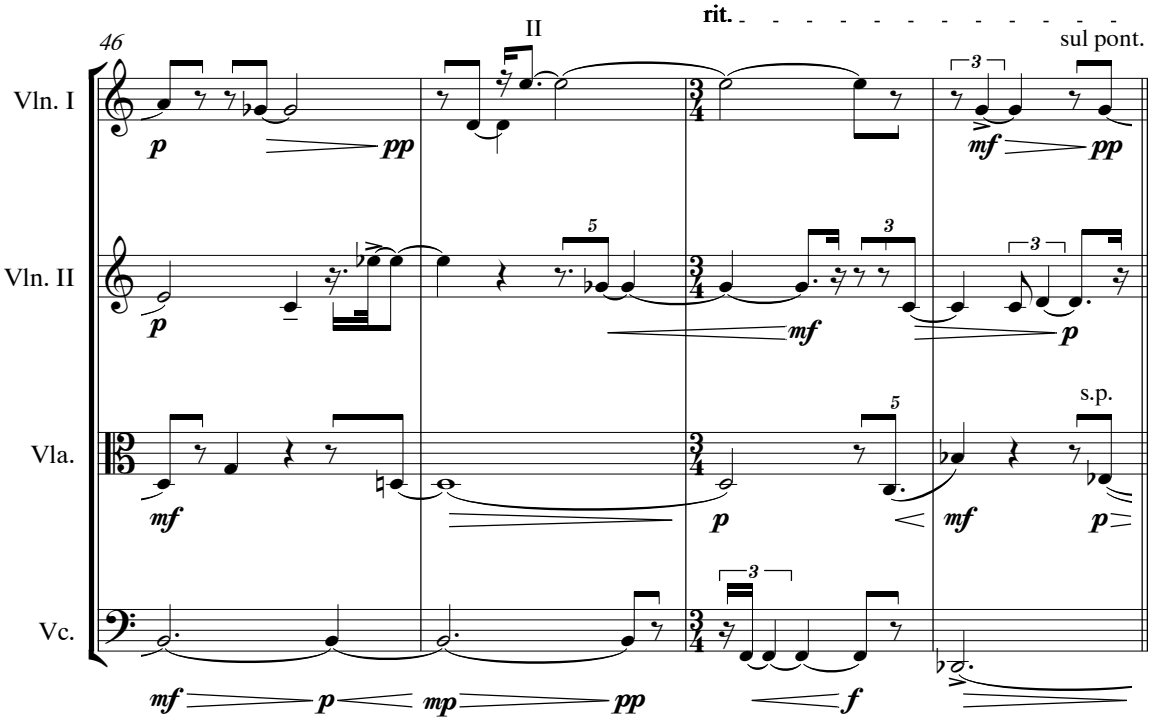

31
Vln. I
Vln. II
Vla.
Vc.

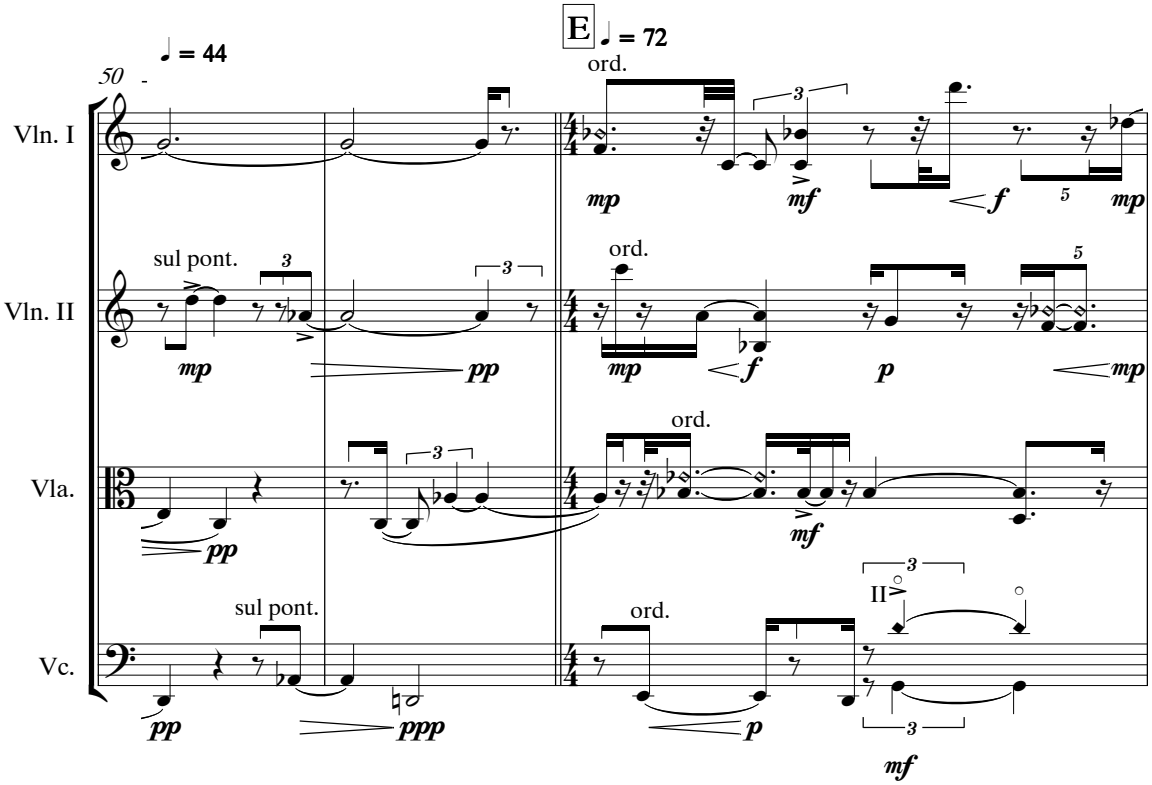

34
Vln. I
Vln. II
Vla.
Vc.

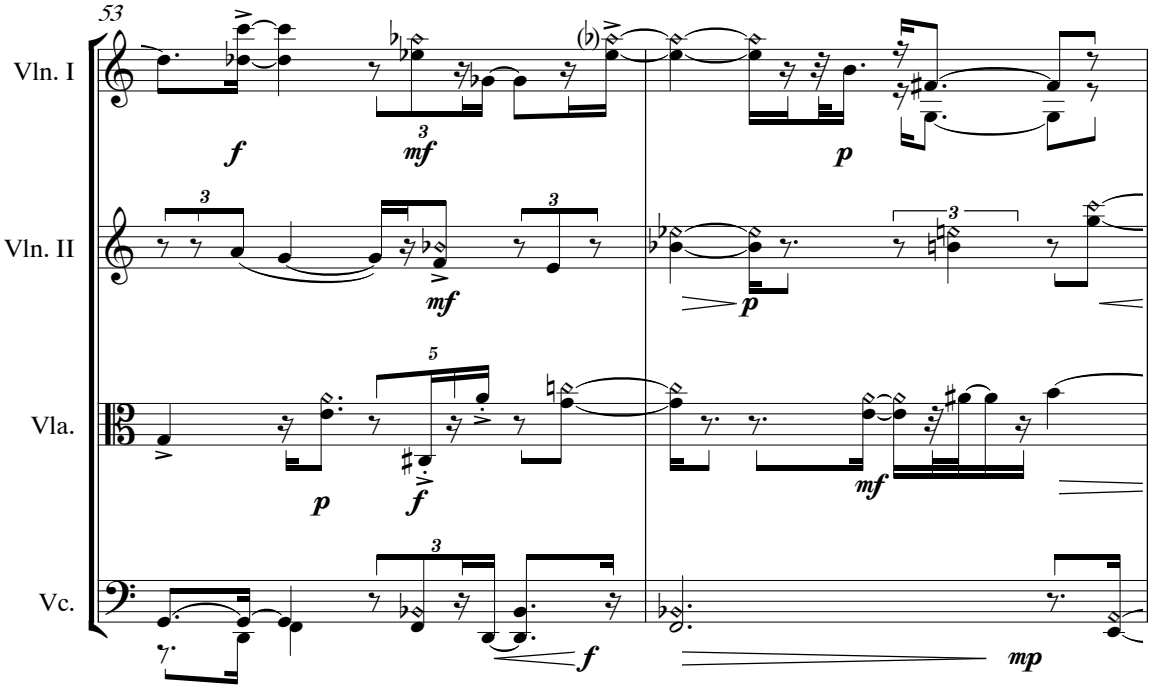

37
Vln. I
Vln. II
Vla.
Vc.
f
p
mf
pp

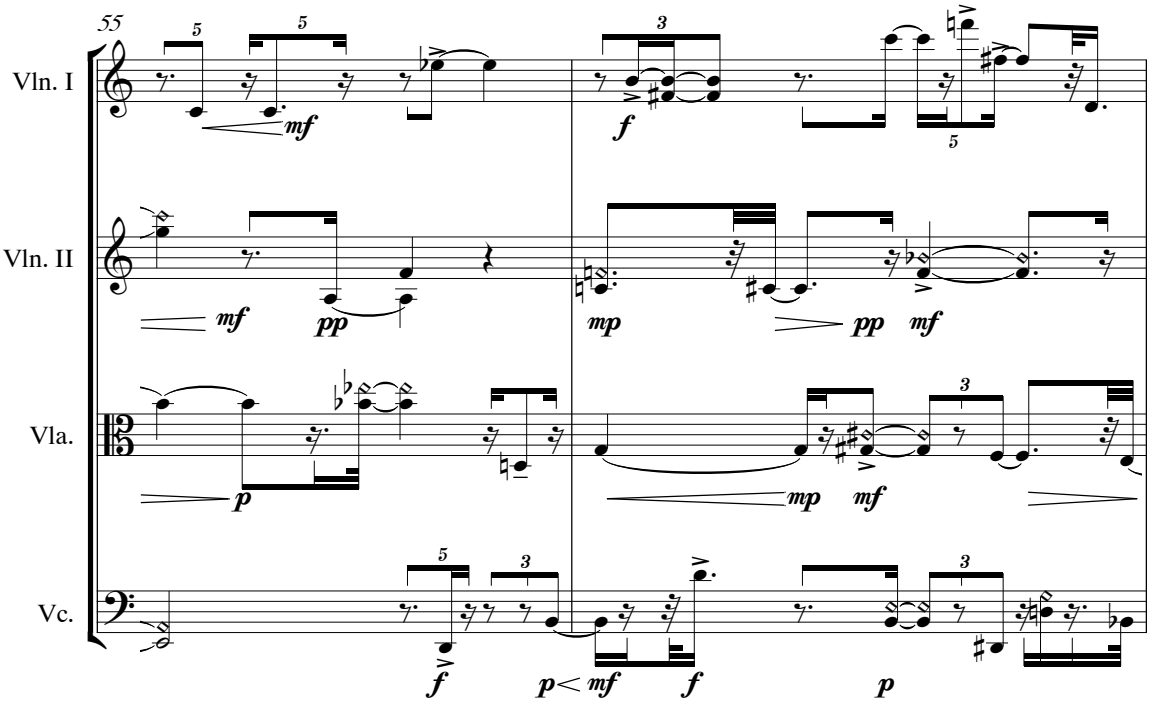

molto rit.
D
♩ = 48
40
Vln. I
Vln. II
Vla.
Vc.
f
p
pp
ff
mf
mp

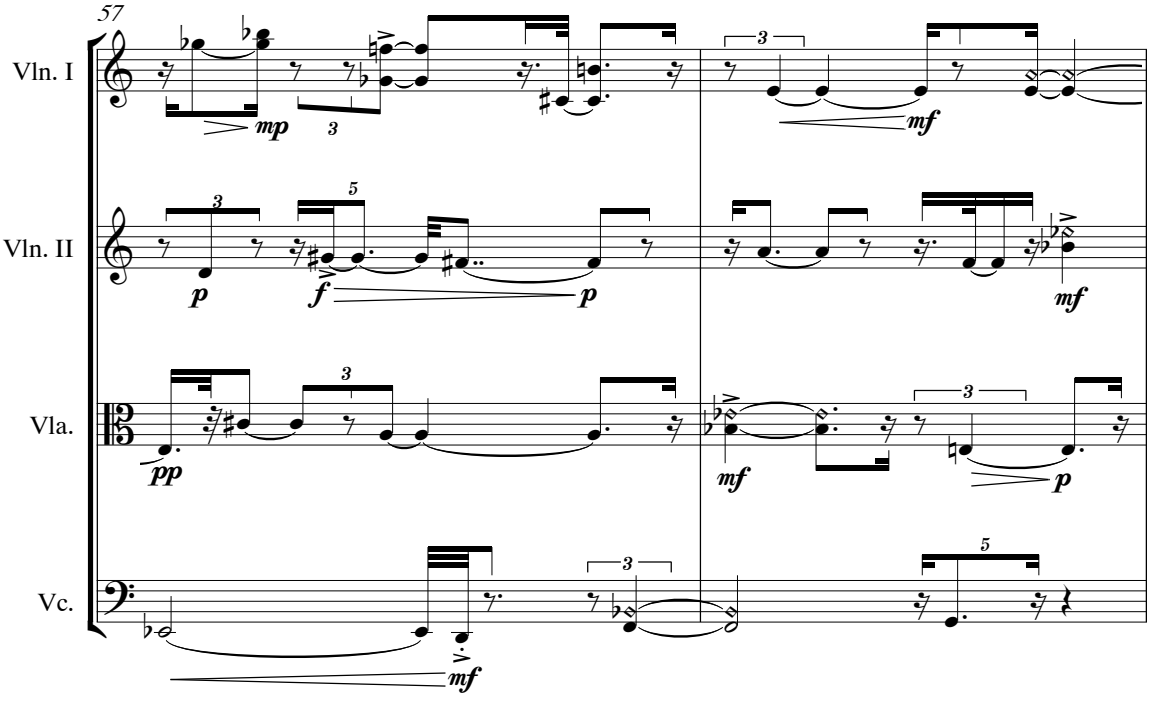

43
poco accel.
poco più mosso
Vln. I
Vln. II
Vla.
Vc.
mp
f
pp
mf
p

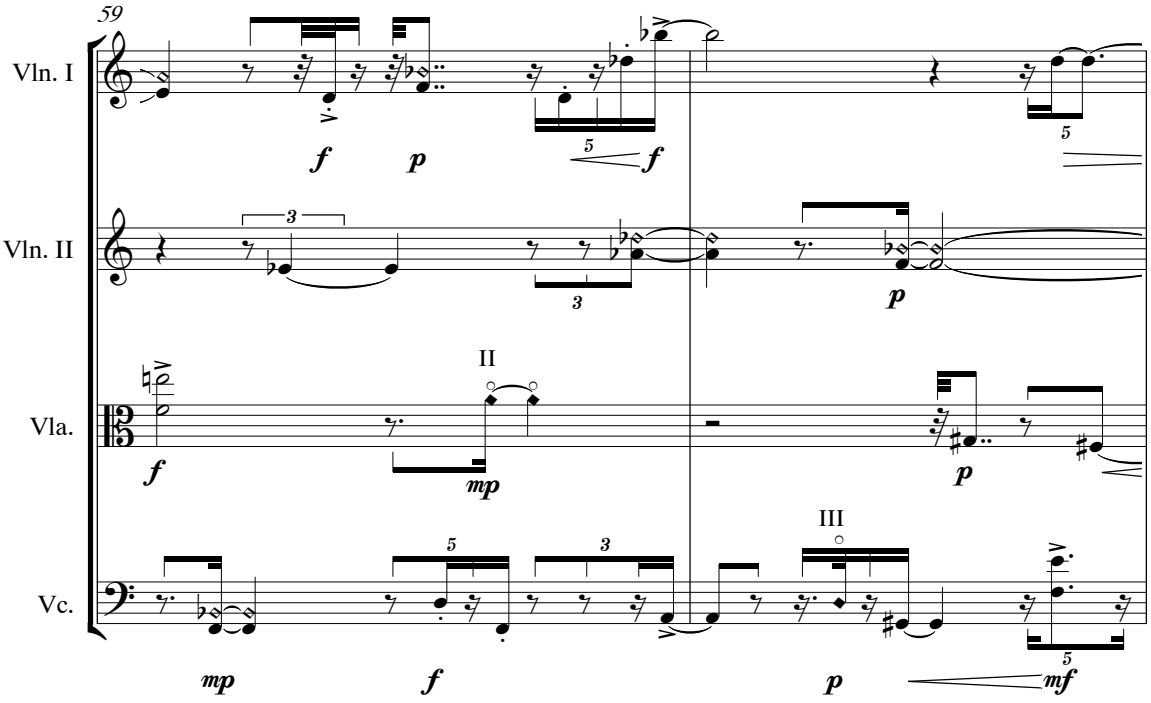

46
II
rit.
sul pont.
s.p.
Vln. I
Vln. II
Vla.
Vc.
pp
mf
p
mp
f

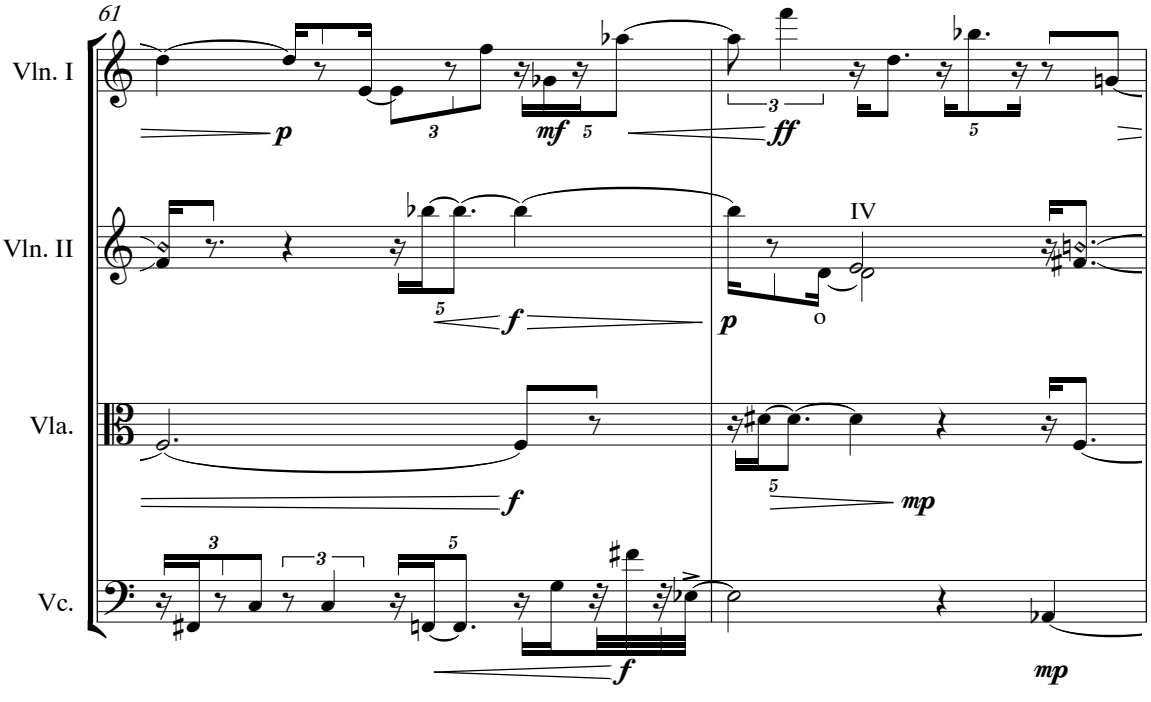

E
♩ = 44
♩ = 72
50
Vln. I
Vln. II
Vla.
Vc.
sul pont.
ord.
mp
pp
ppp
mf
f
p
II

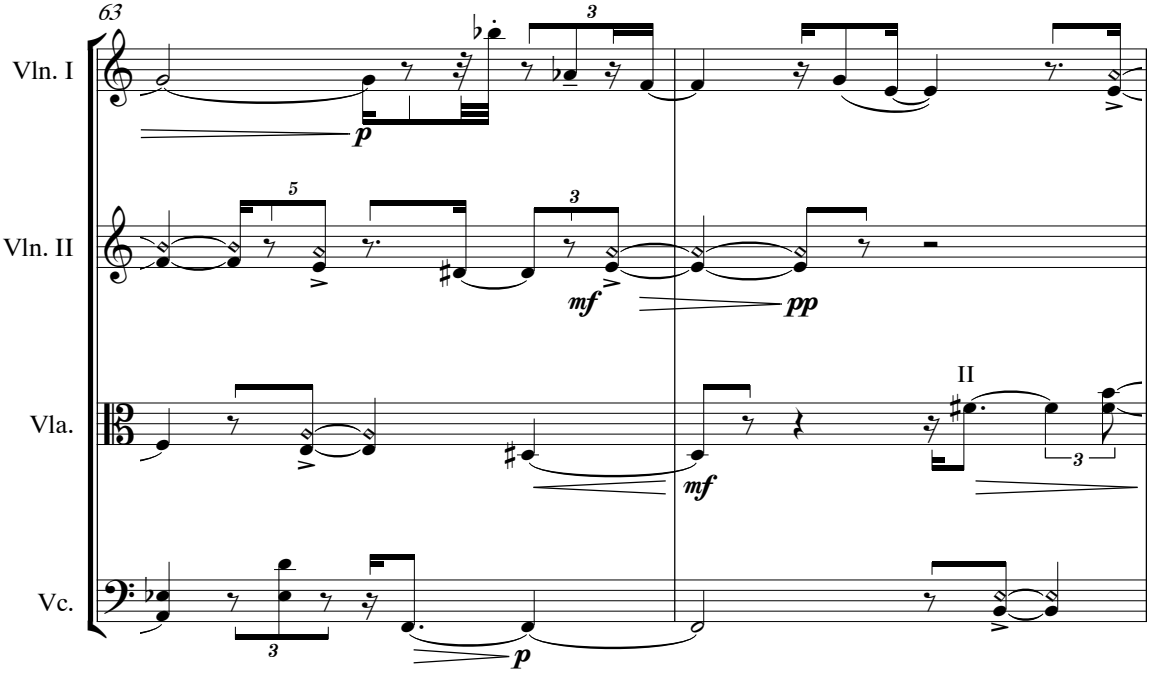

53
Vln. I
Vln. II
Vla.
Vc.
f
mf
p
mp

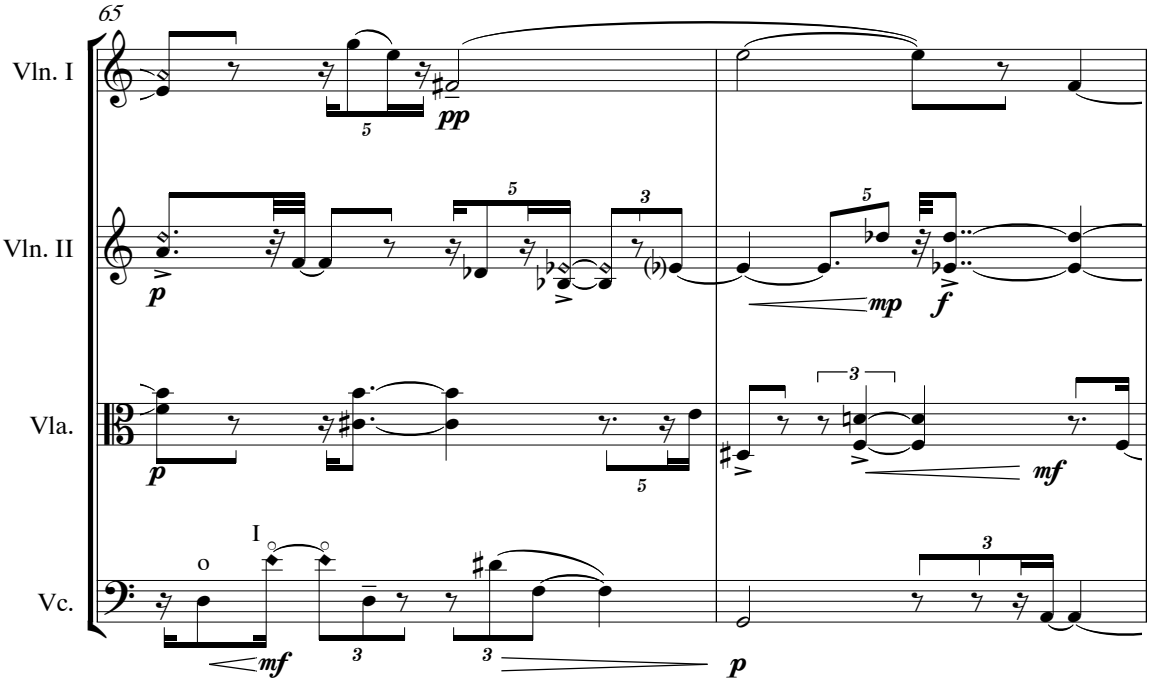

55
Vln. I
Vln. II
Vla.
Vc.

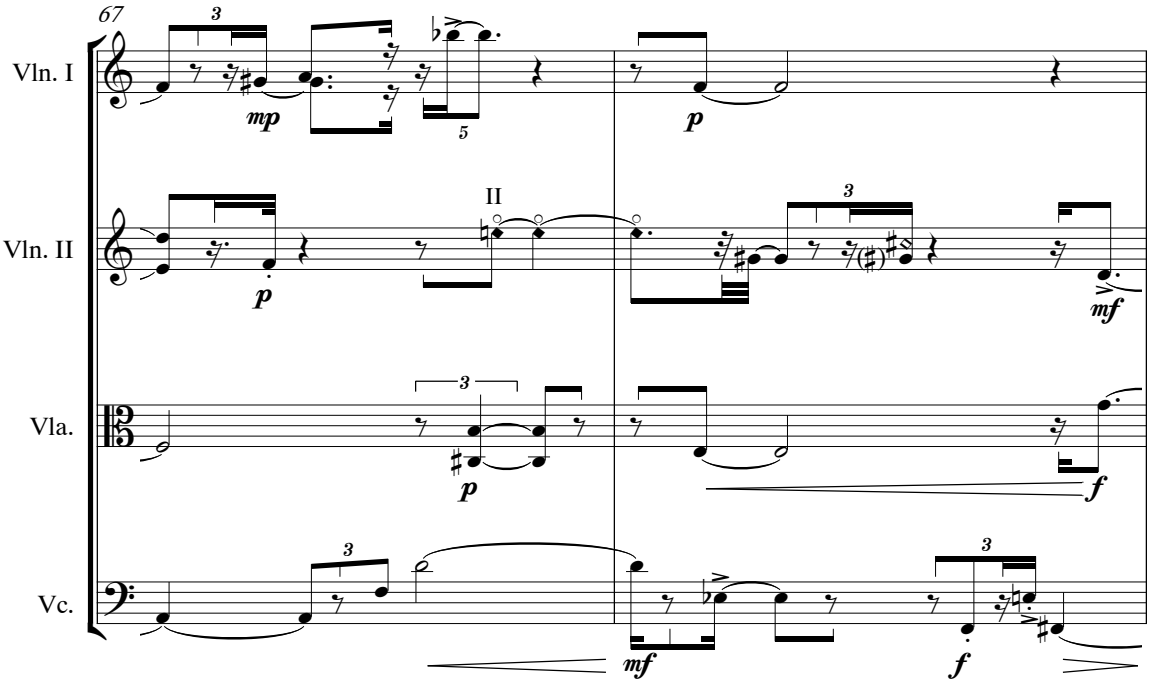

57
Vln. I
Vln. II
Vla.
Vc.

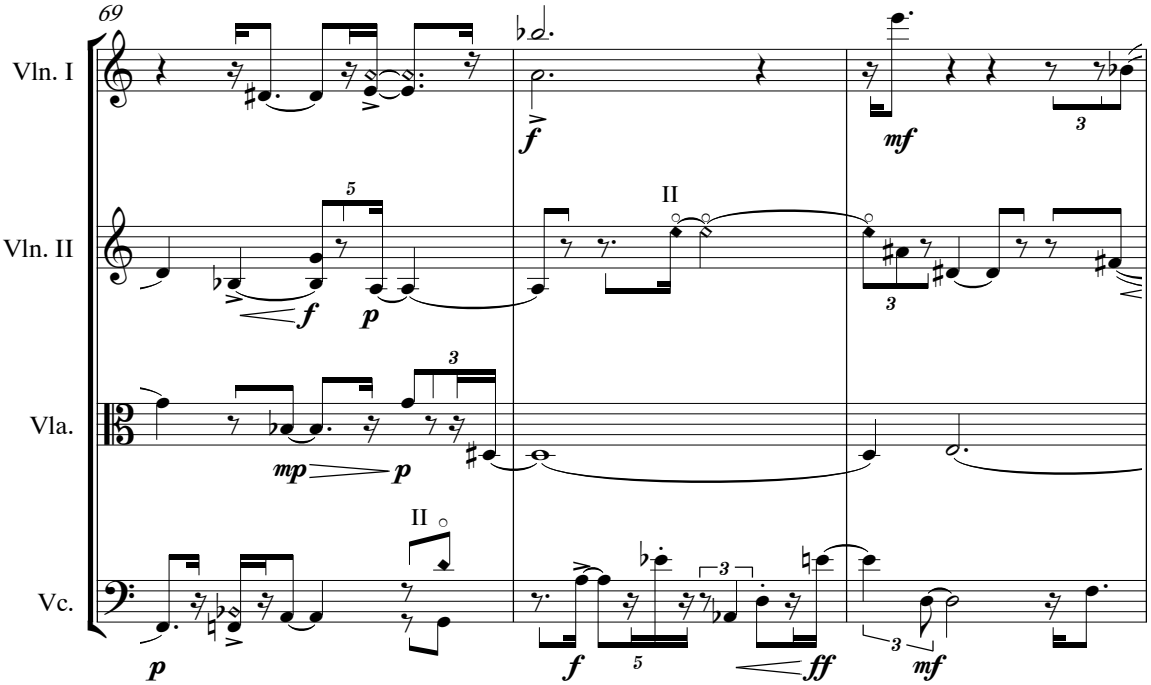

59
Vln. I
Vln. II
Vla.
Vc.
II
III
f
p
mp
mf

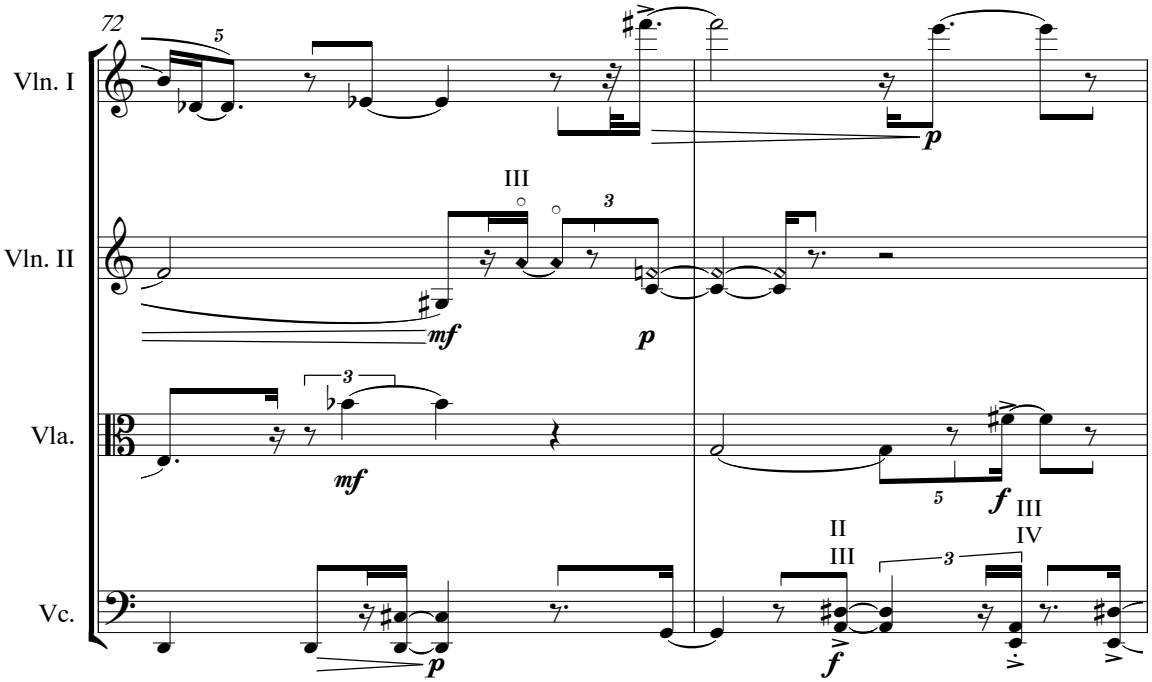

61
Vln. I
Vln. II
Vla.
Vc.
IV
p
mf
ff
f
mp

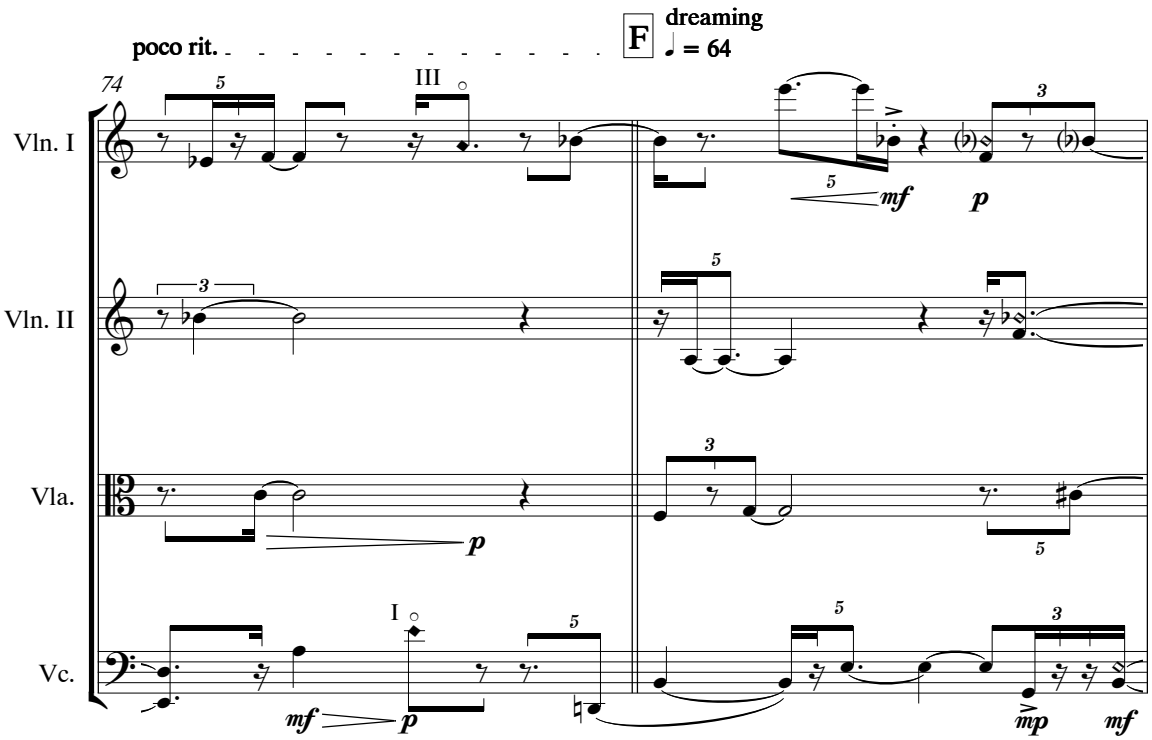

63
Vln. I
Vln. II
Vla.
Vc.
II

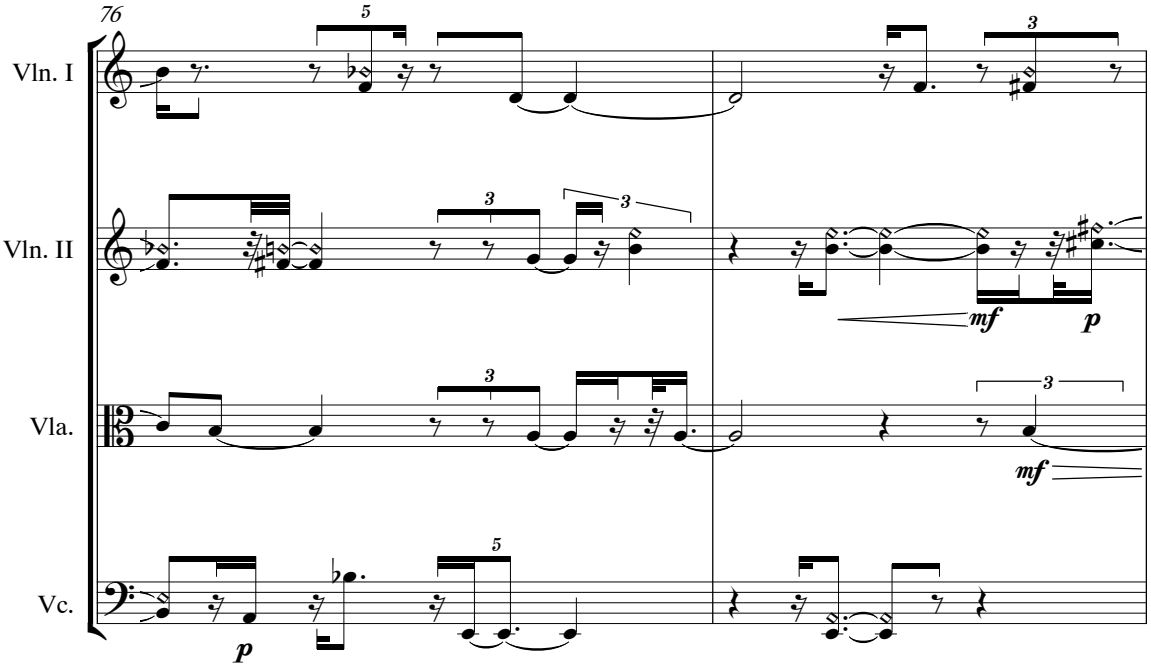

65
Vln. I
Vln. II
Vla.
Vc.
I
o

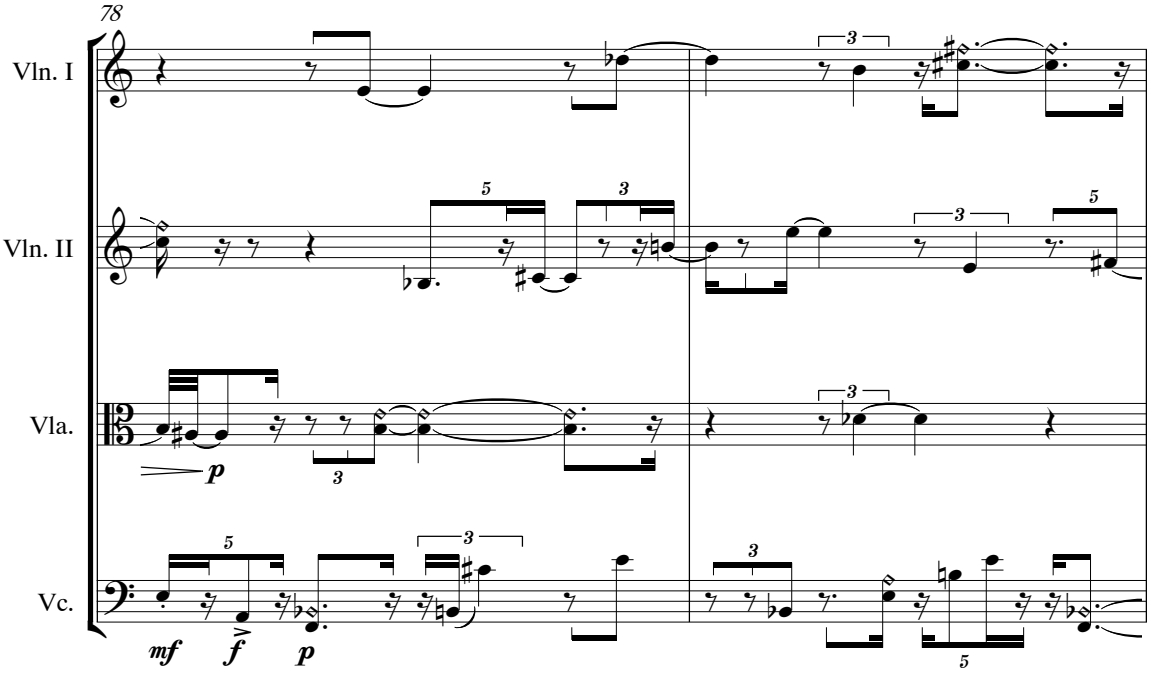

67
Vln. I
Vln. II
Vla.
Vc.
II
mp
p
mf
f

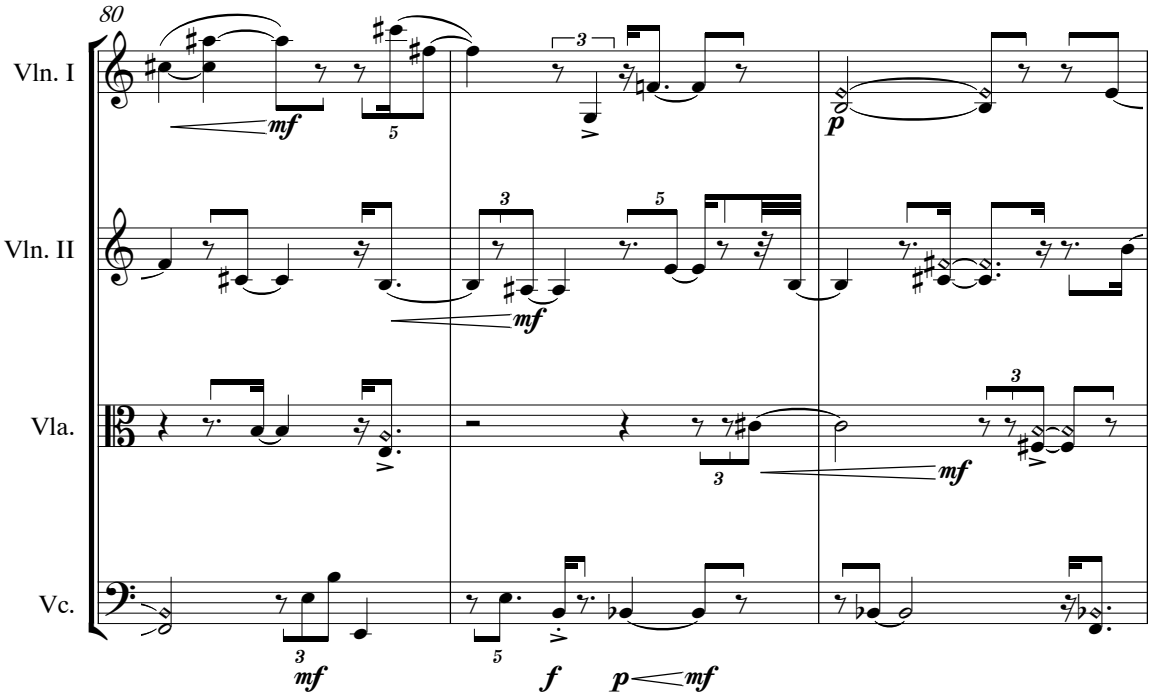

69
Vln. I
Vln. II
Vla.
Vc.
II
f
mf
p
mp
ff

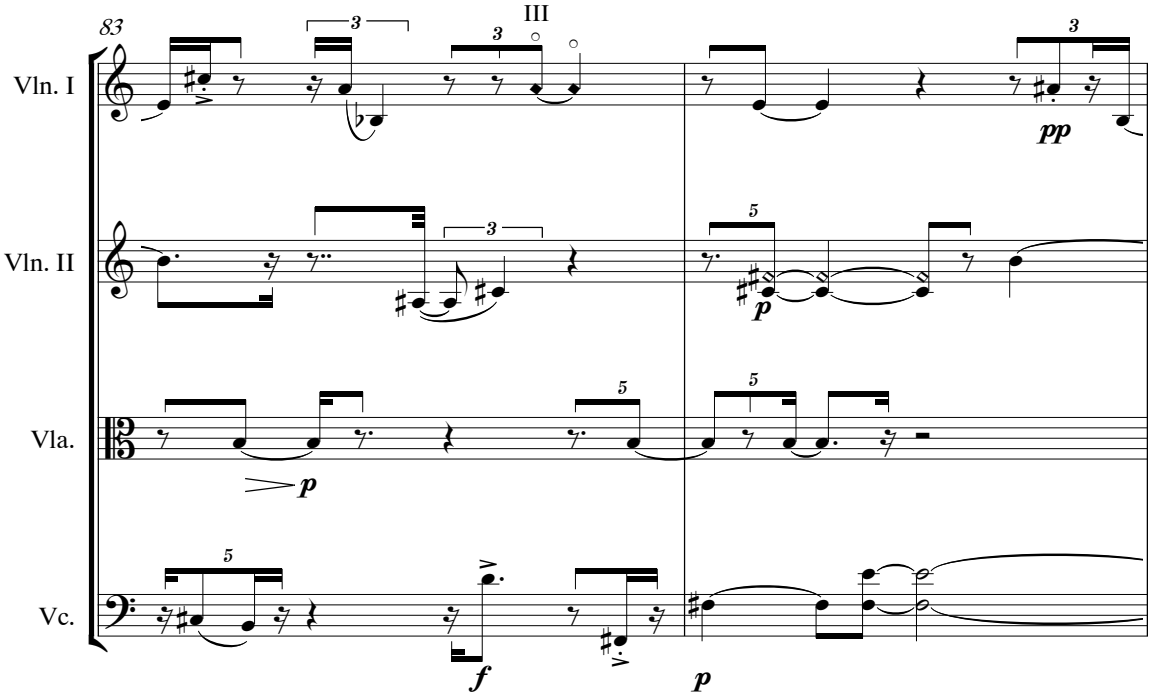

72
Vln. I
Vln. II
Vla.
Vc.
III
II
III
IV
mf
p
f

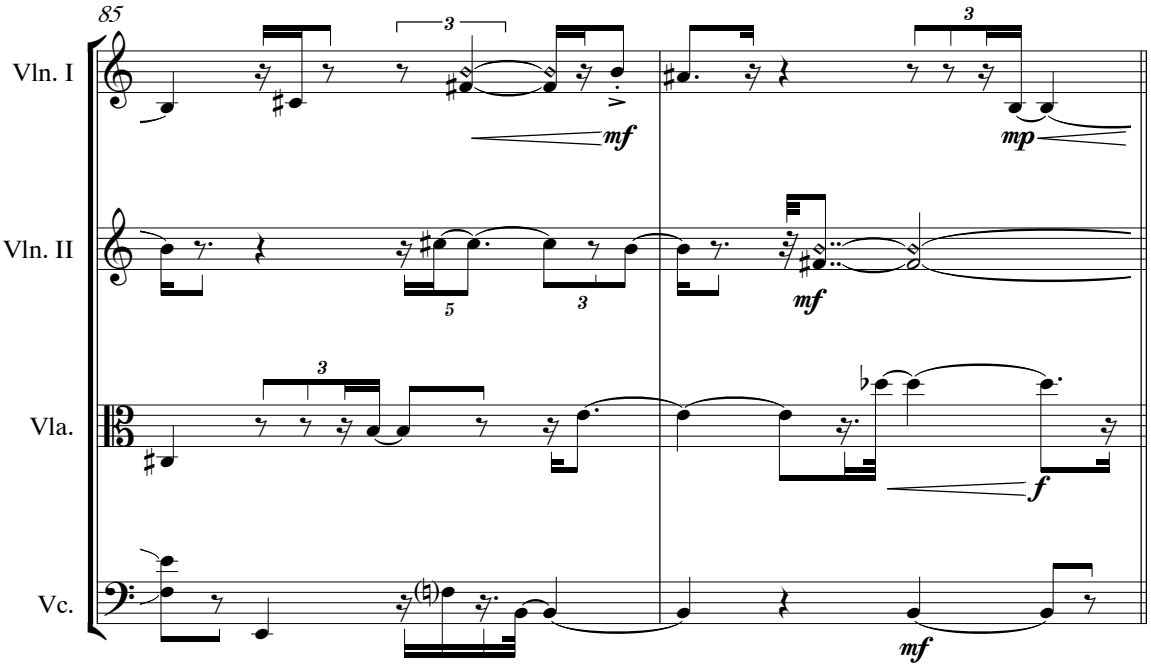

poco rit.
F
dreaming
♩ = 64
74
Vln. I
Vln. II
Vla.
Vc.
III
I
mf
p
mp

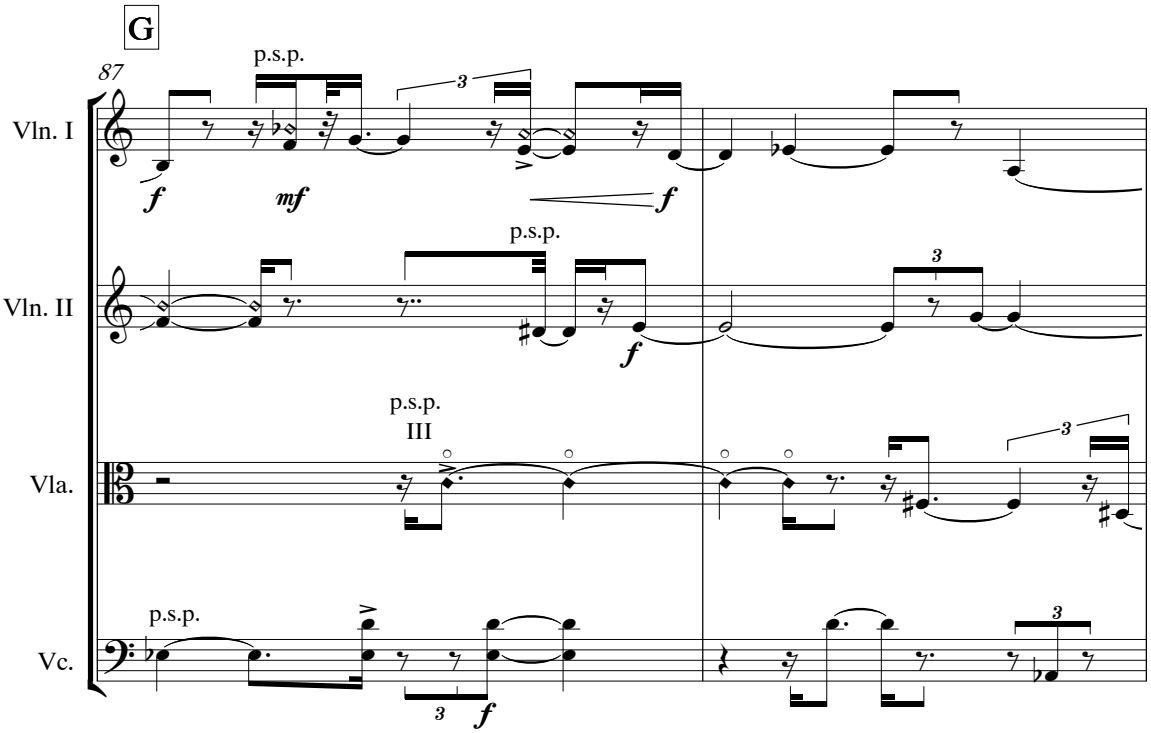

76
Vln. I
Vln. II
Vla.
Vc.
mf
p
mf
p

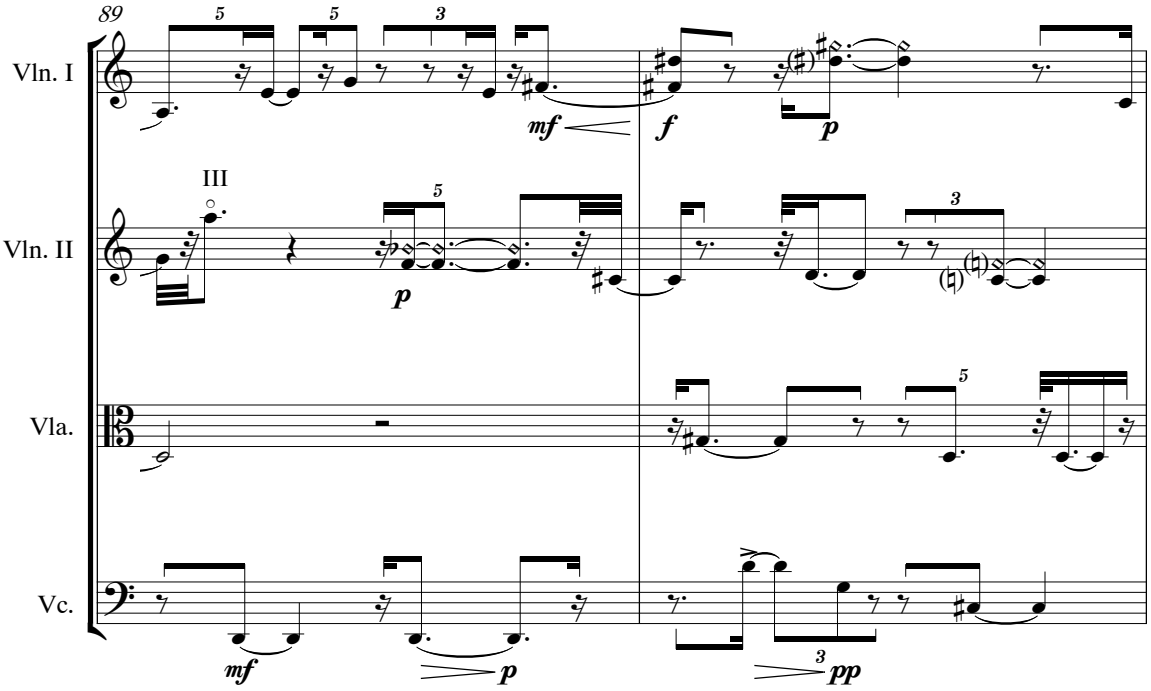

78
Vln. I
Vln. II
Vla.
Vc.
p
mf
f
p

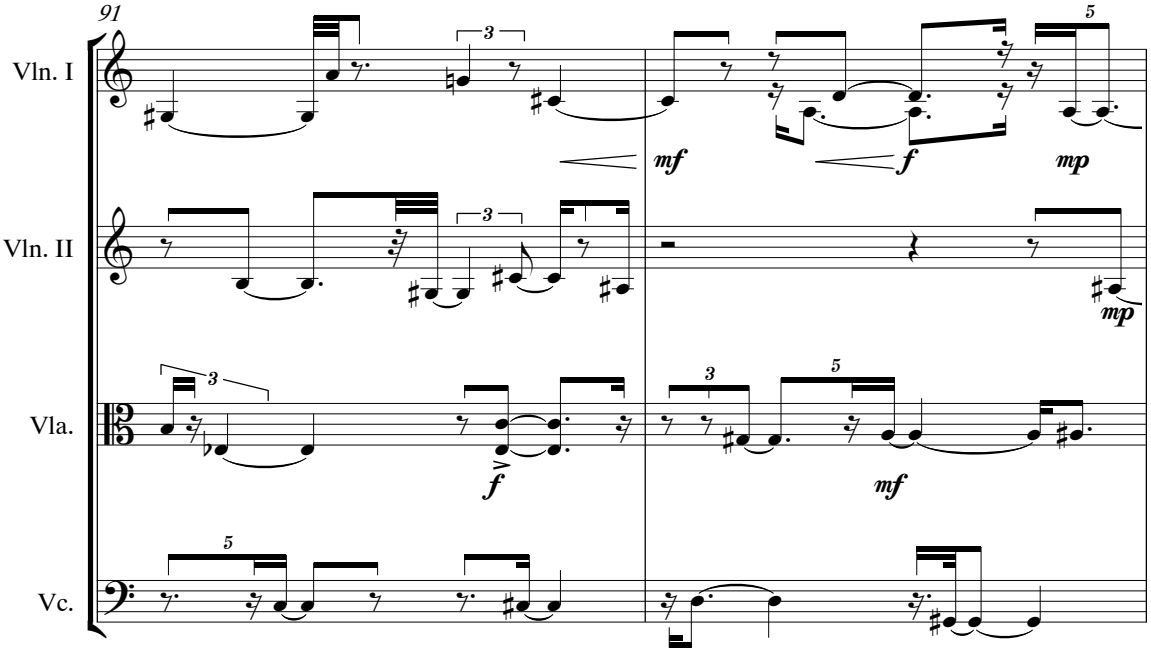

80
Vln. I
Vln. II
Vla.
Vc.
mf
p
mf
mf
mf
f
p
mf

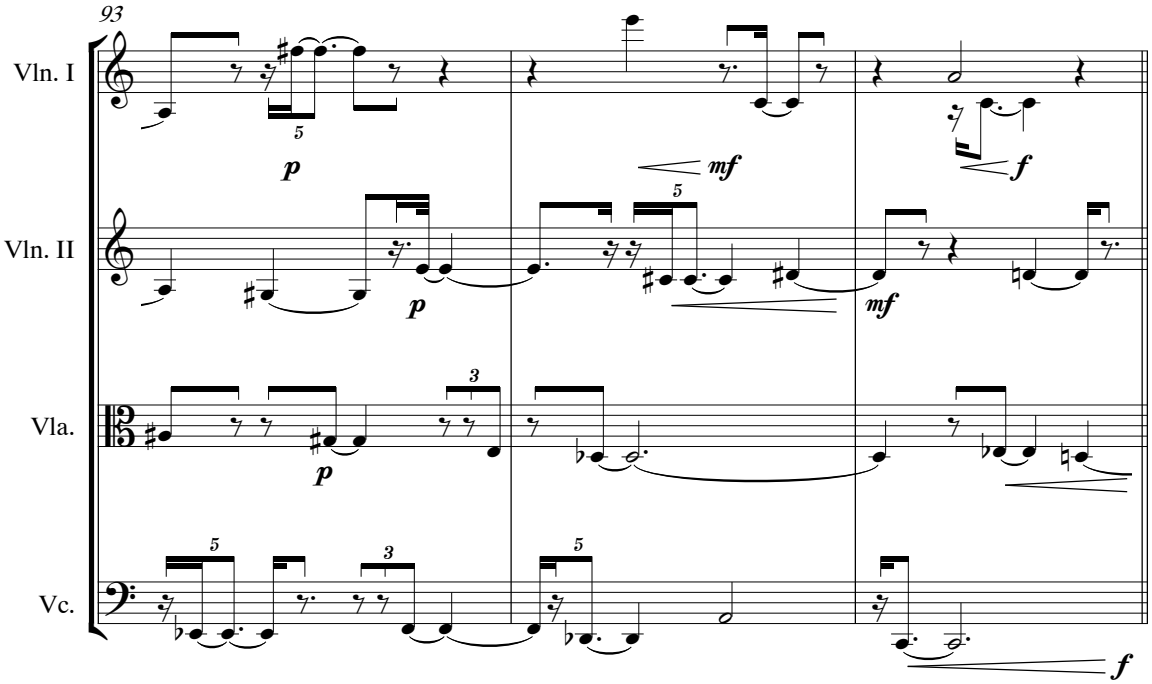

83
III
Vln. I
Vln. II
Vla.
Vc.
pp
p
p
f
p

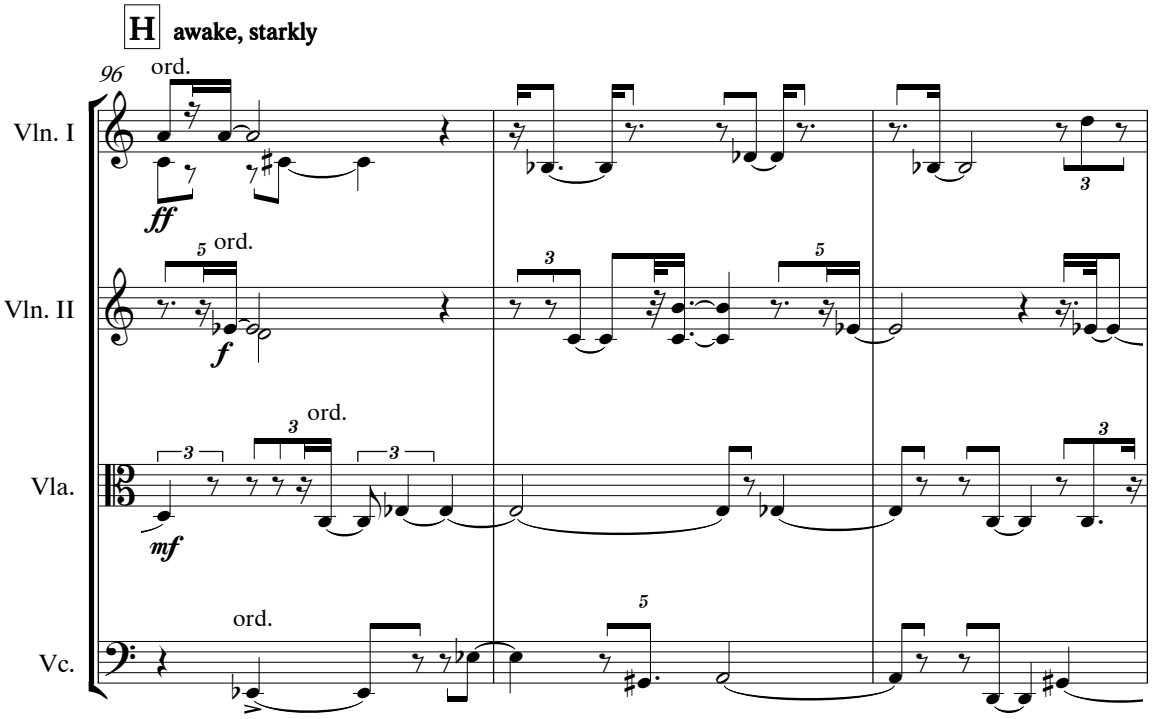

85
Vln. I
Vln. II
Vla.
Vc.
mf
mp
mf
f
mf

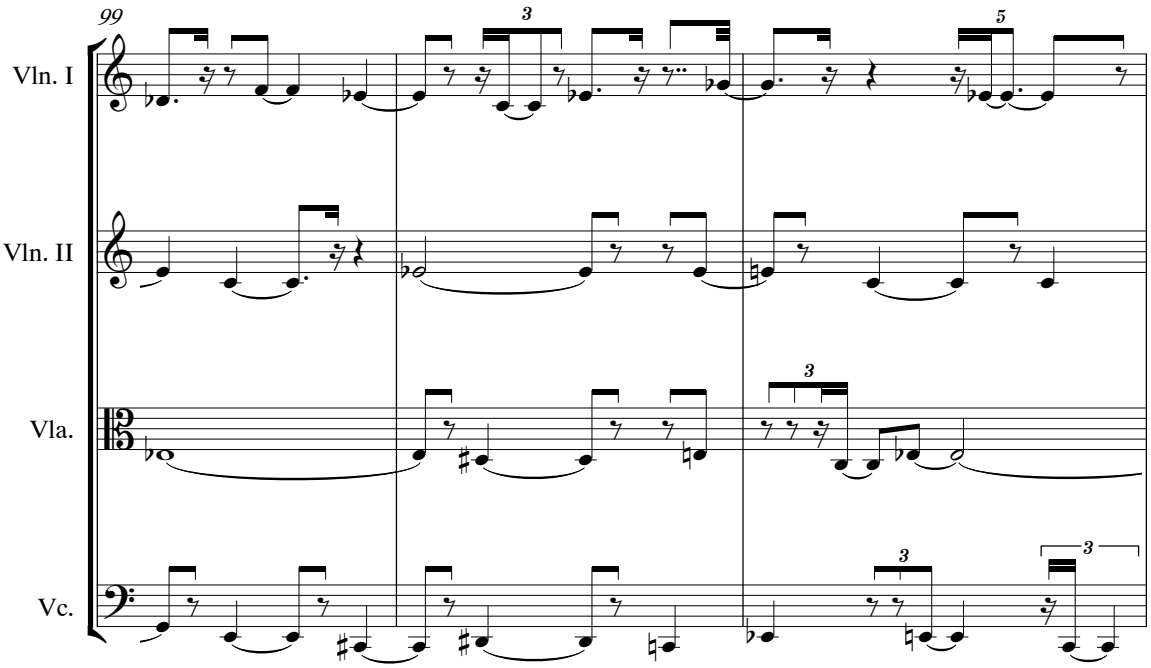

G
87
Vln. I
Vln. II
Vla.
Vc.
p.s.p.
p.s.p.
p.s.p.
III
p.s.p.
f
mf
f
f
f

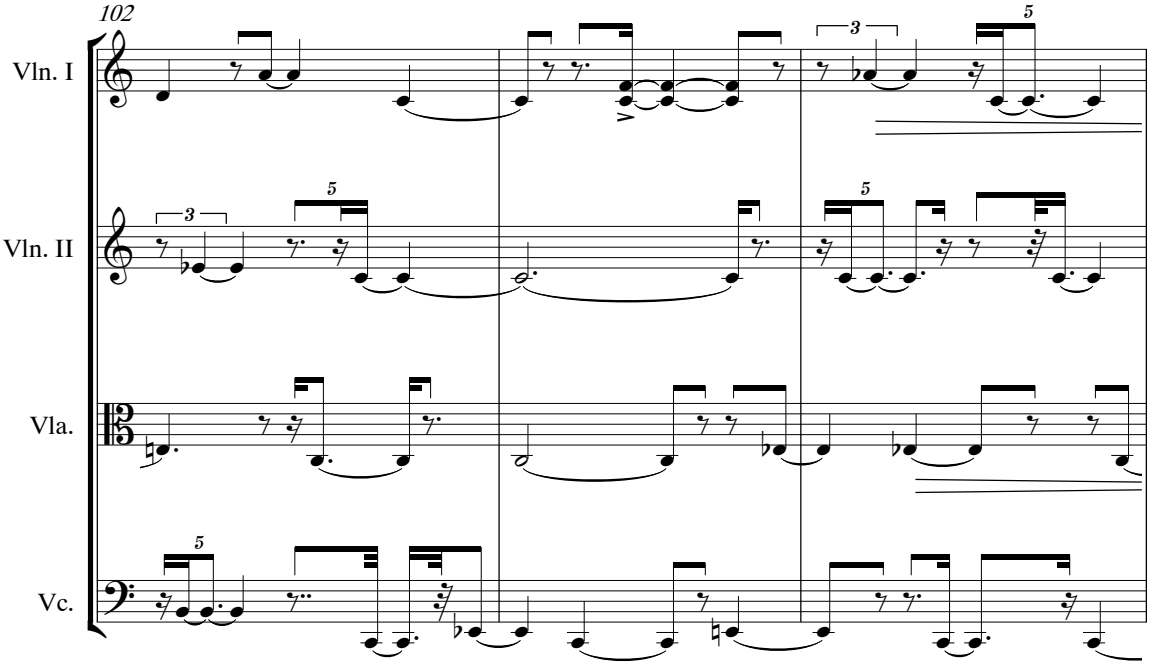

89
Vln. I
Vln. II
Vla.
Vc.
III
mf
f
p
p
mf
p
pp

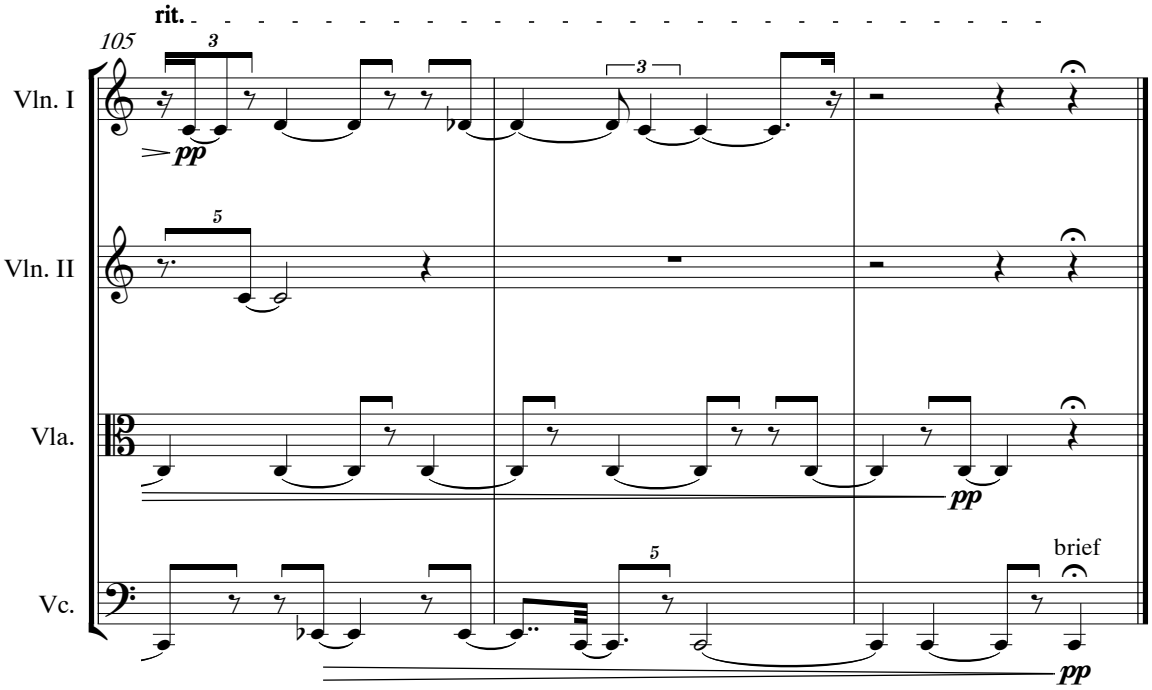

91
Vln. I
Vln. II
Vla.
Vc.
mf
f
mp
mp
f
mf


93
Vln. I
Vln. II
Vla.
Vc.
p
mf
f
p
mf
p
f

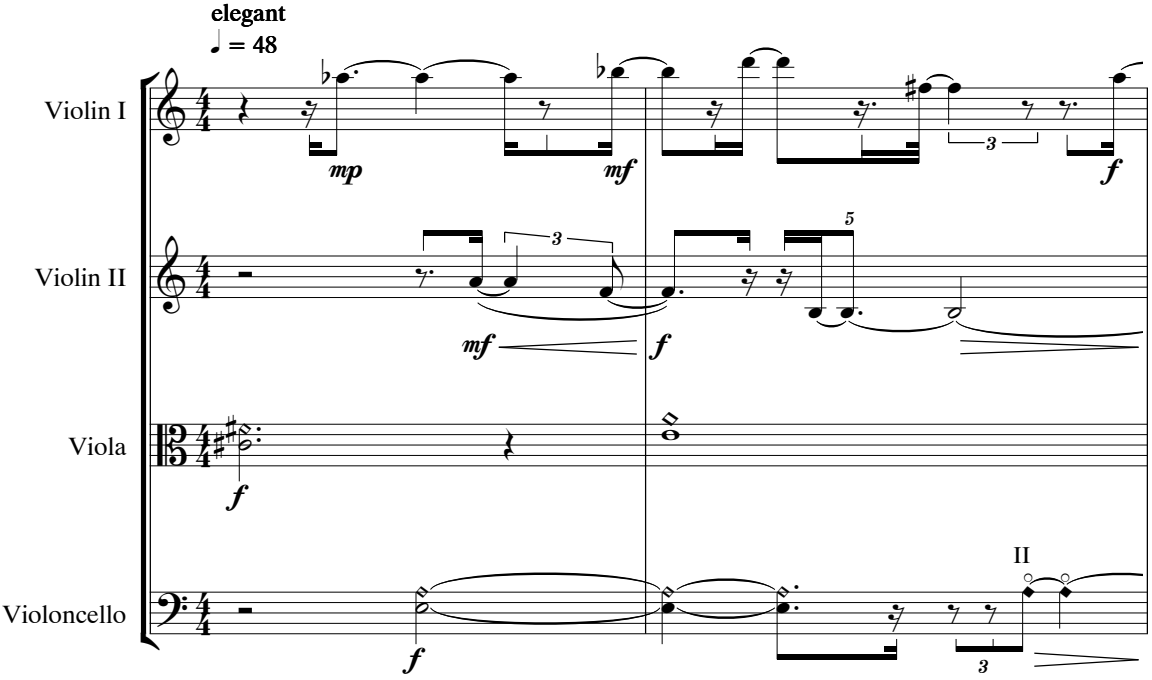

H awake, starkly
96
Vln. I
Vln. II
Vla.
Vc.
ord.
ff
ord.
f
ord.
mf
ord.

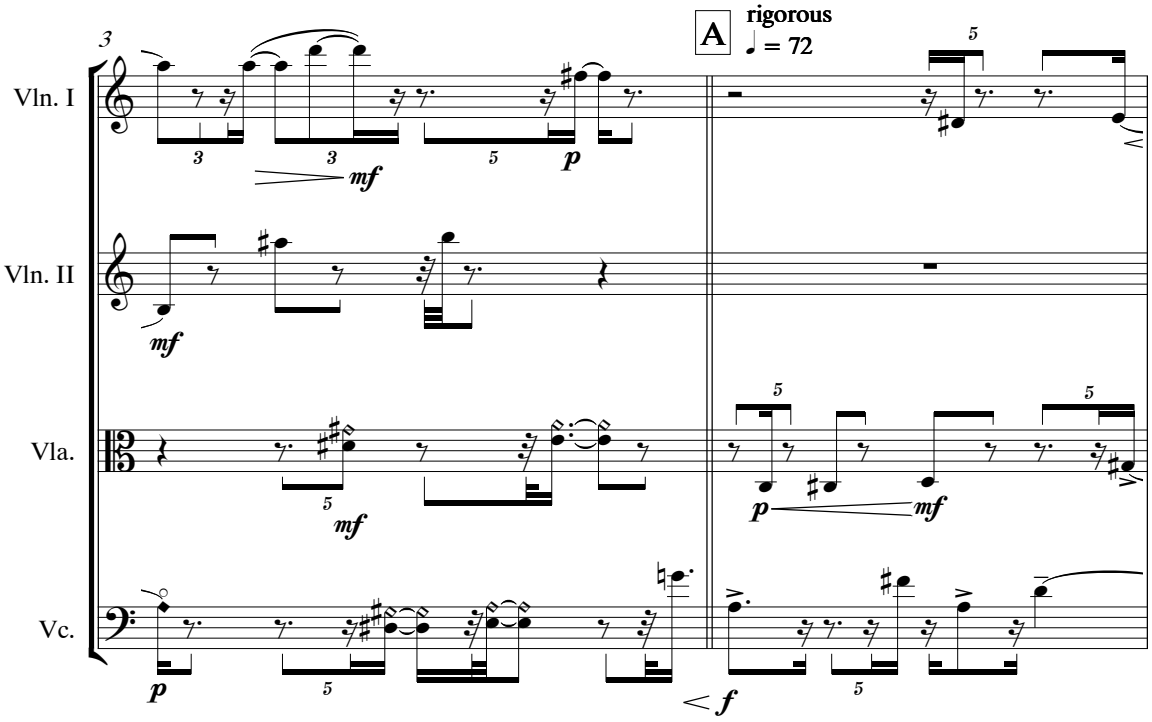

99
Vln. I
Vln. II
Vla.
Vc.

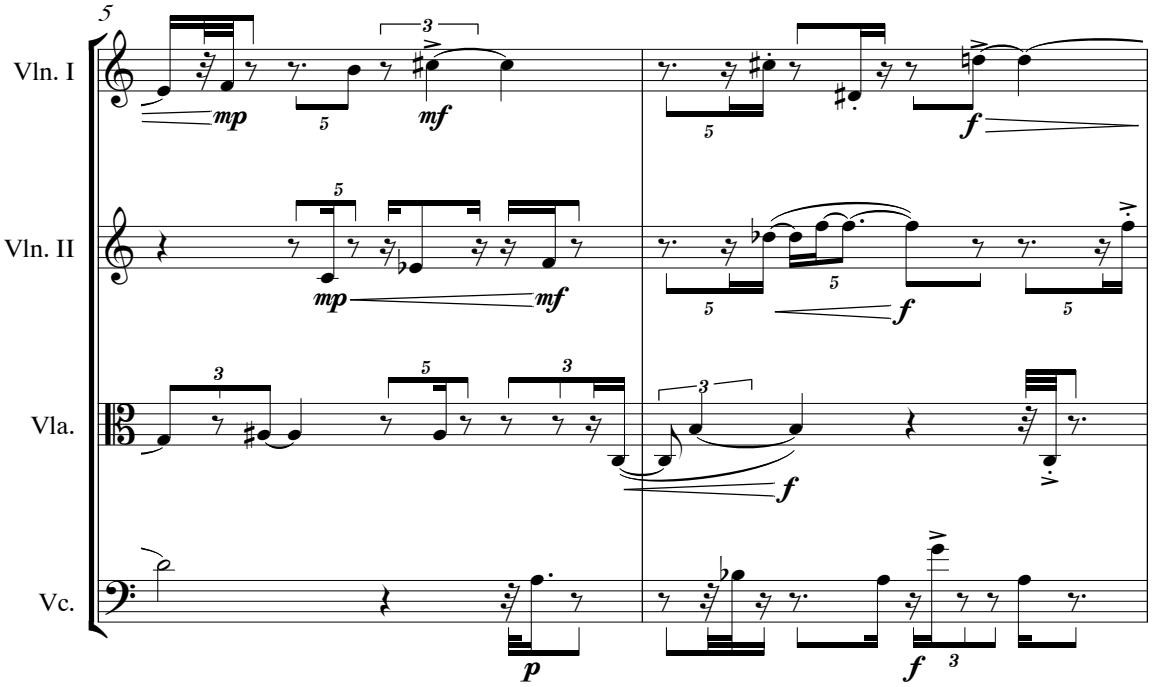

102
Vln. I
Vln. II
Vla.
Vc.

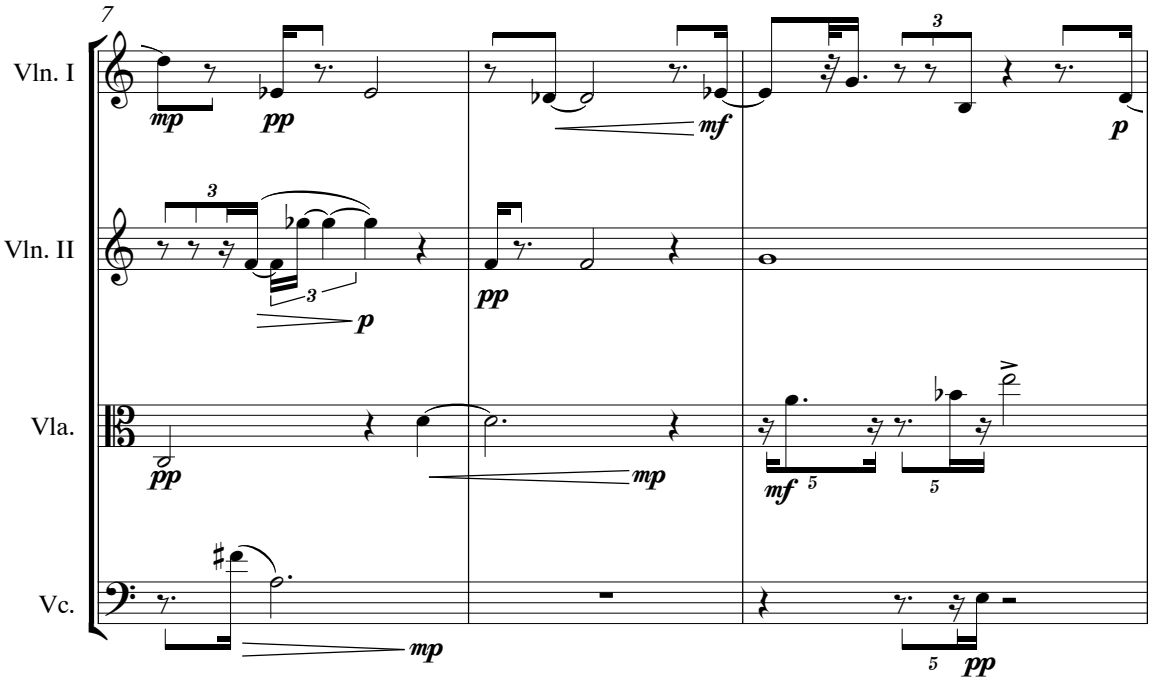

rit.
105
Vln. I
Vln. II
Vla.
Vc.
pp
brief

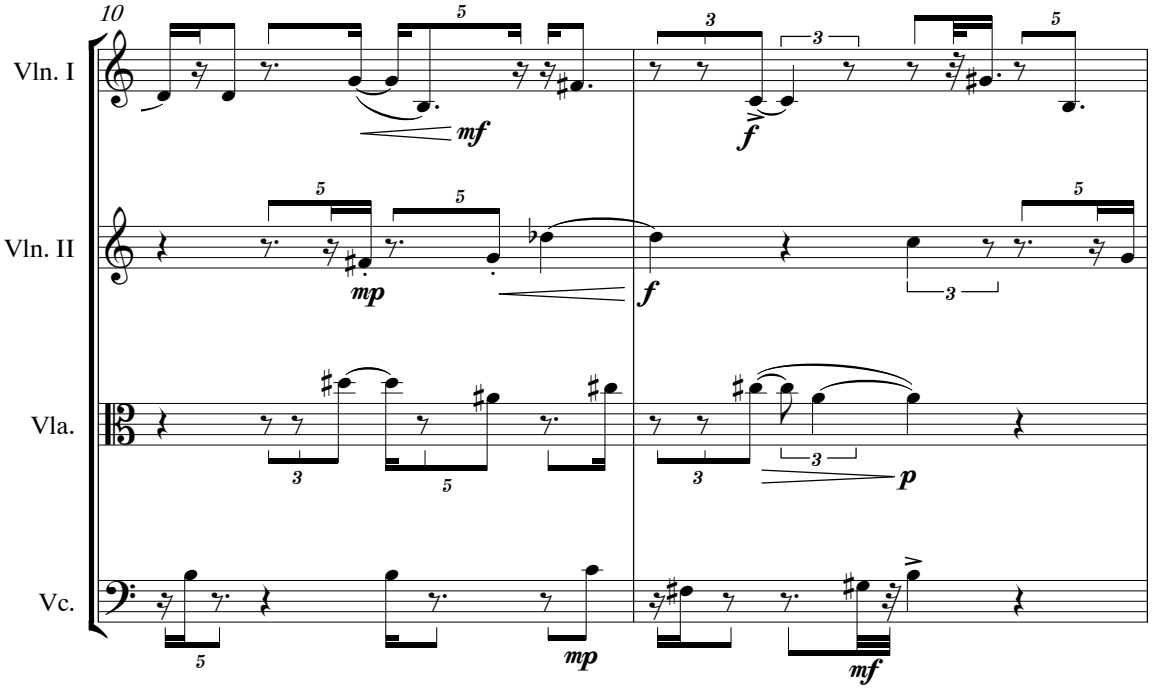
IV.

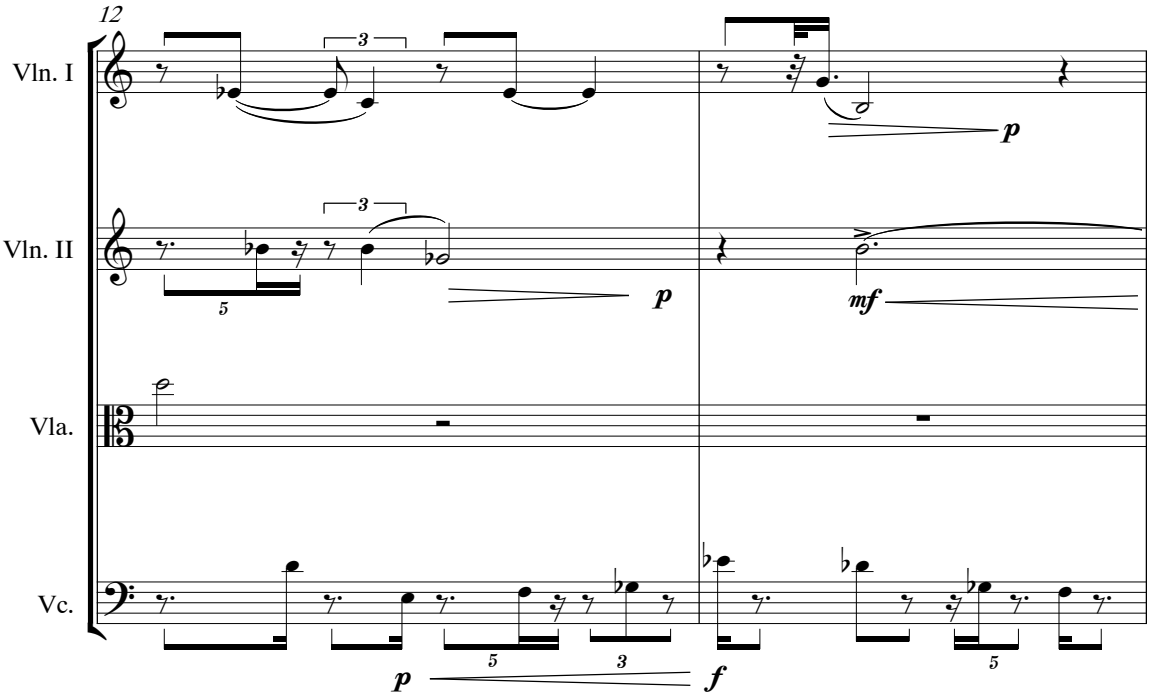

elegant
♩ = 48
Violin I
Violin II
Viola
Violoncello
mp
mf
f
II

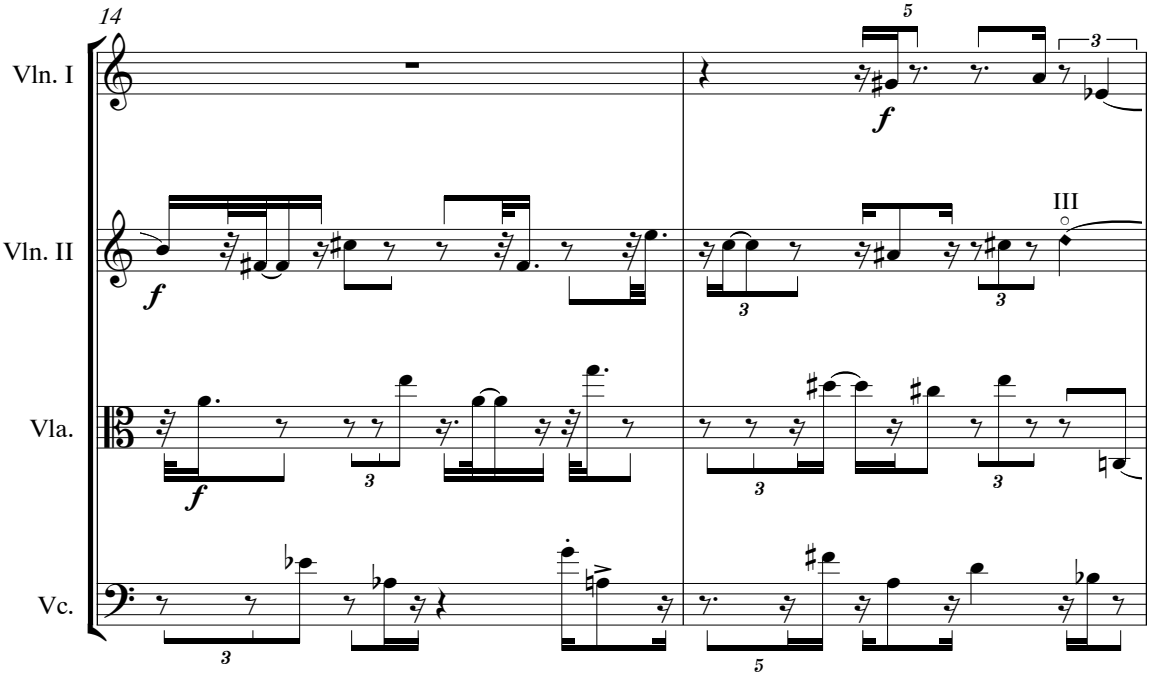

A
rigorous
♩ = 72
Vln. I
Vln. II
Vla.
Vc.

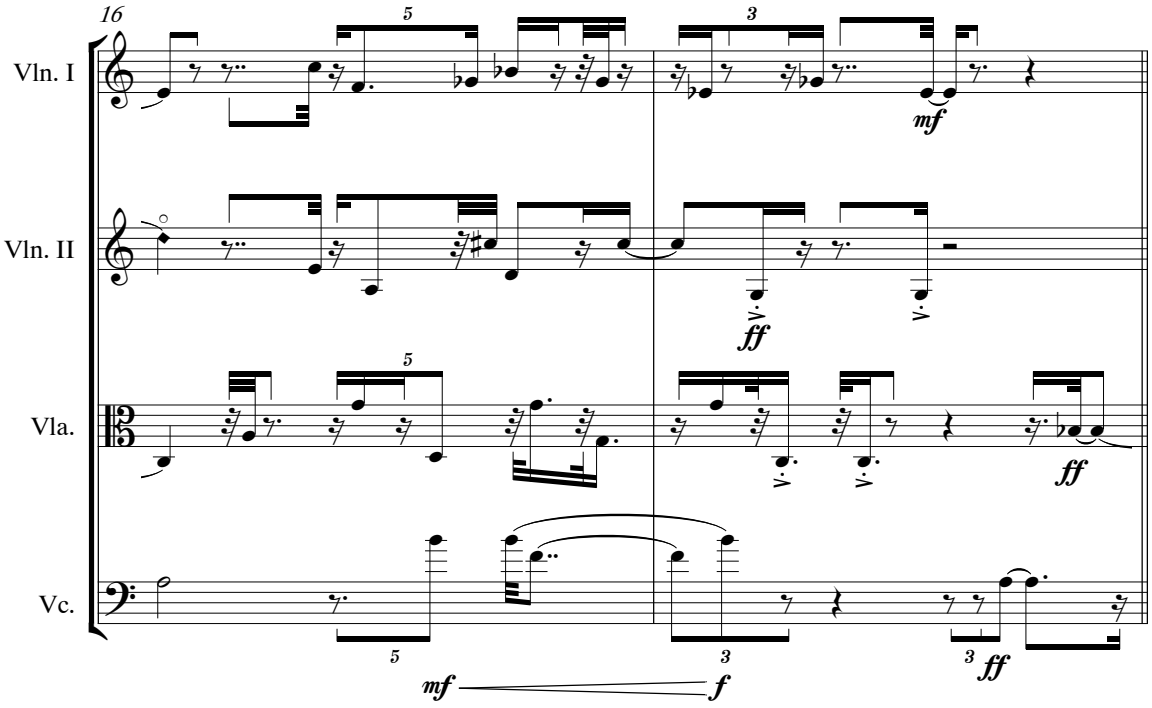

Vln. I
Vln. II
Vla.
Vc.

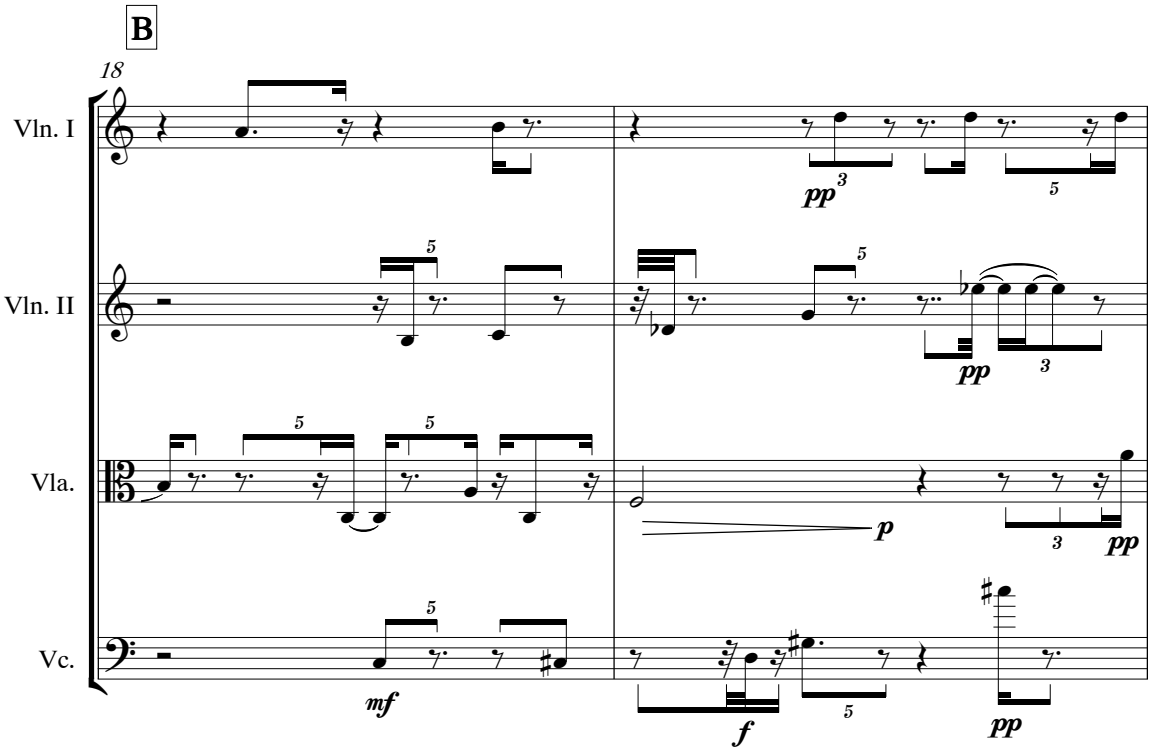

7
Vln. I
Vln. II
Vla.
Vc.
mp
pp
mf
p
pp
p
pp
mp
mf
mp

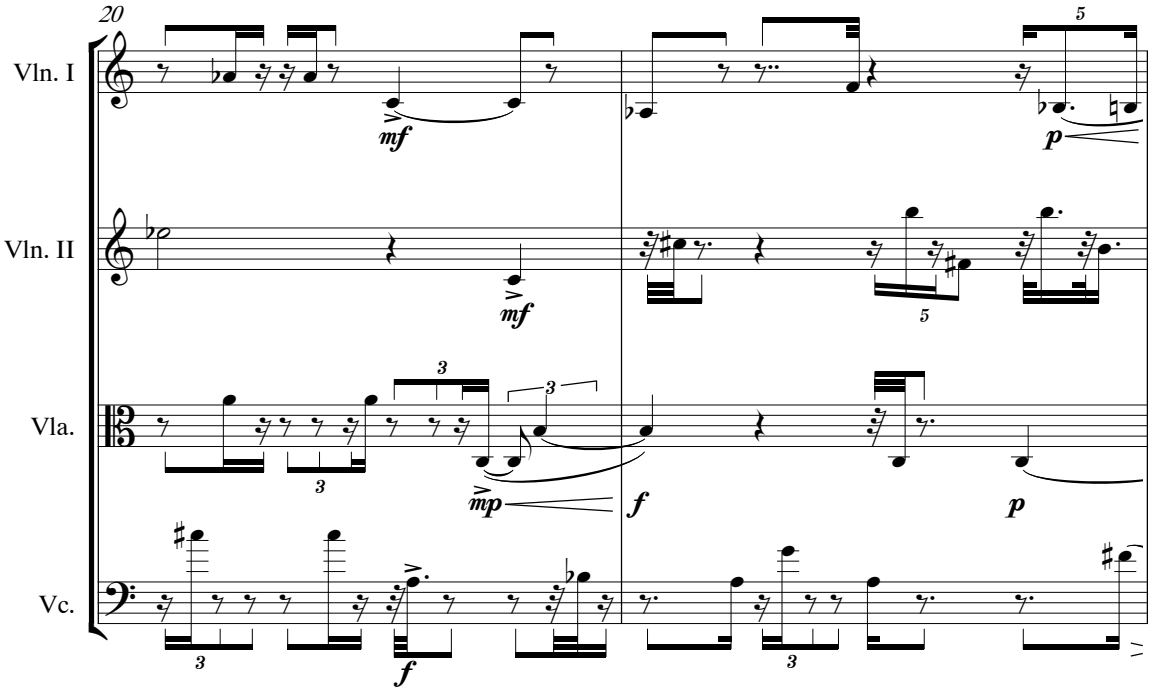

10
Vln. I
Vln. II
Vla.
Vc.
mf
f
mp
f
p
mp
mf

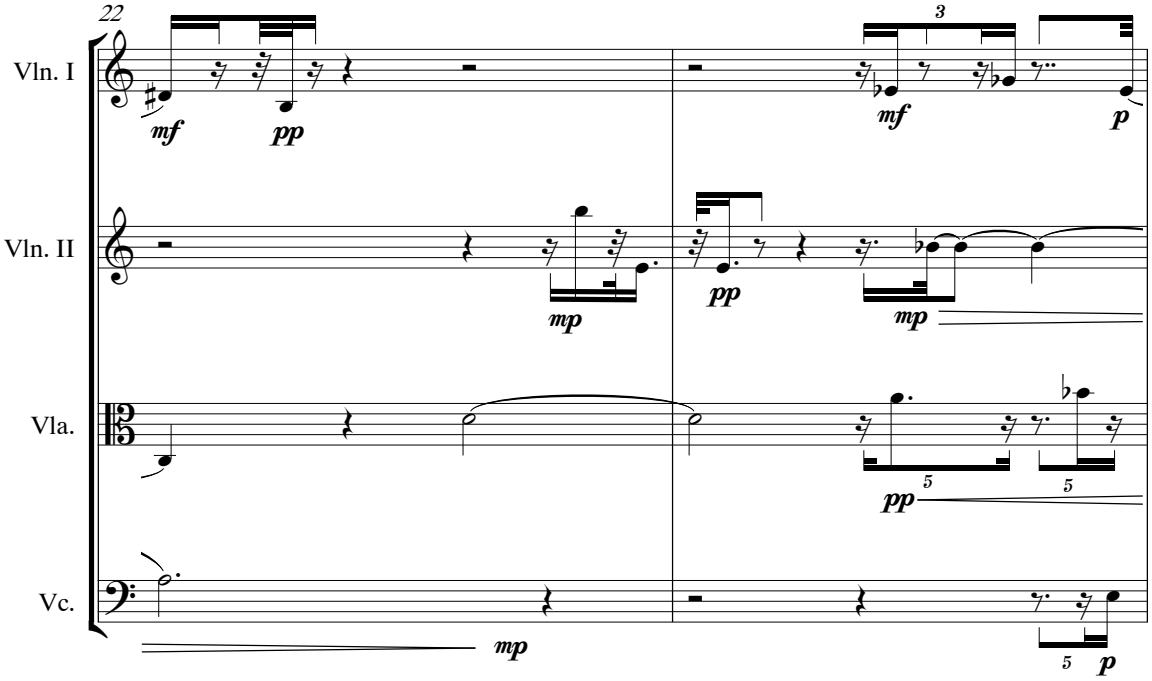

12
Vln. I
Vln. II
Vla.
Vc.
p
mf
f

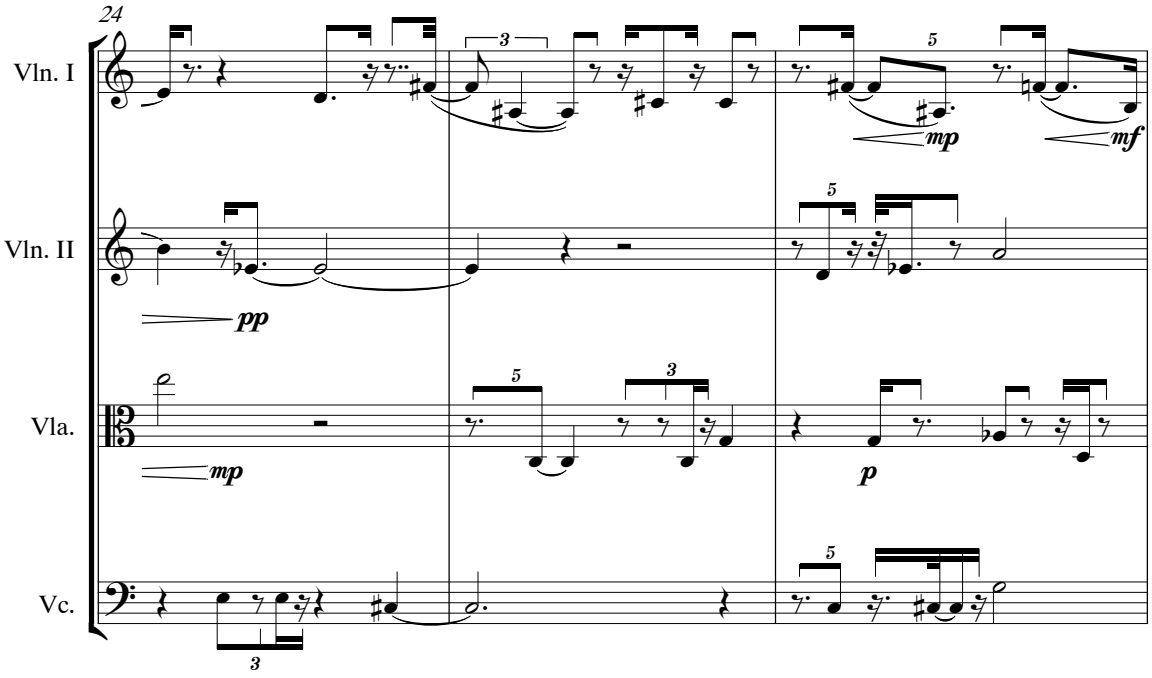

14
Vln. I
Vln. II
Vla.
Vc.
III
f

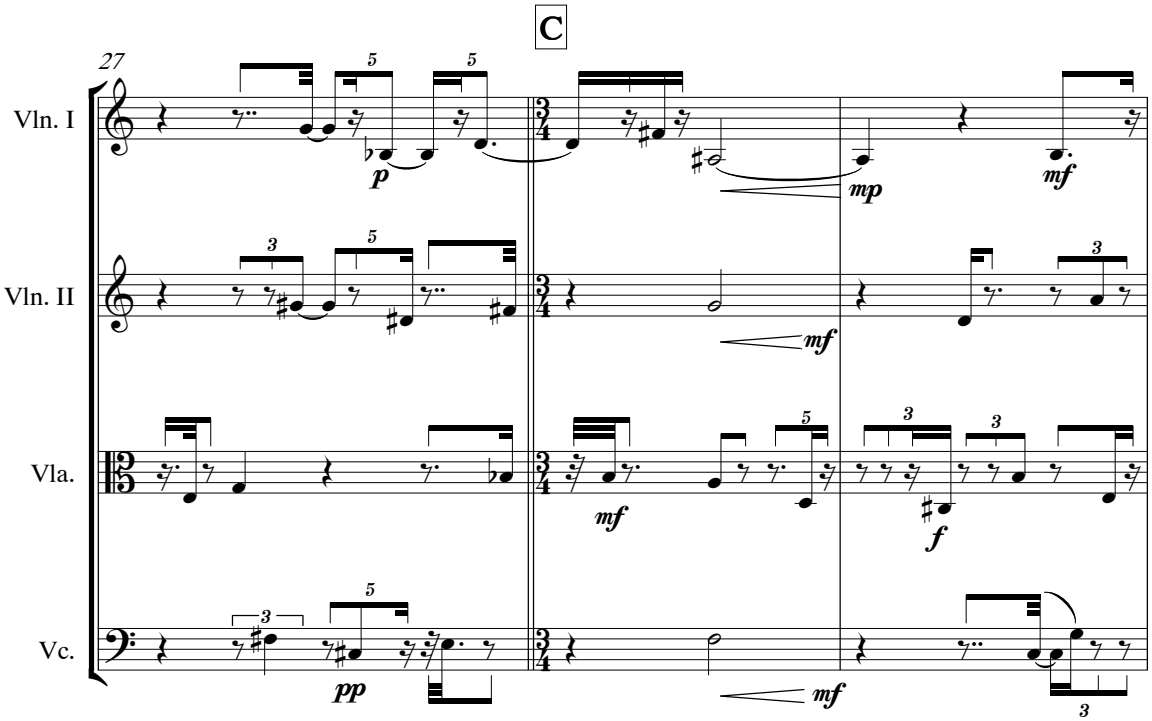

16
Vln. I
Vln. II
Vla.
Vc.
mf
ff
ff
mf
f
ff

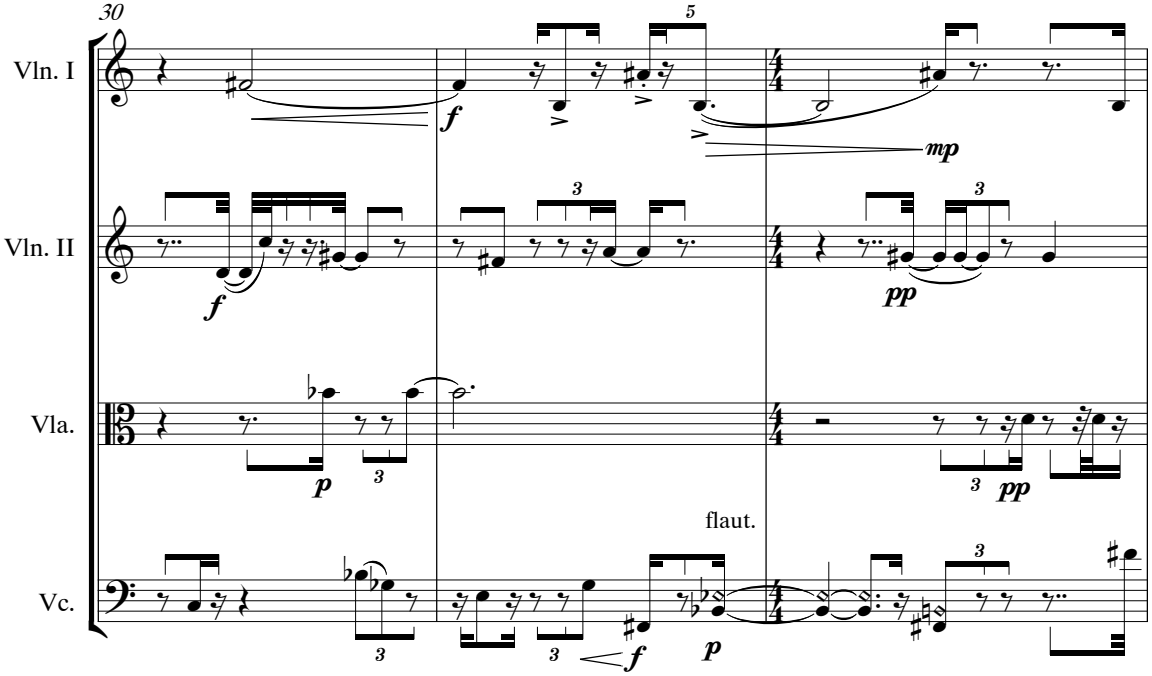

B
18
Vln. I
Vln. II
Vla.
Vc.
pp
pp
p
pp
mf
f
pp

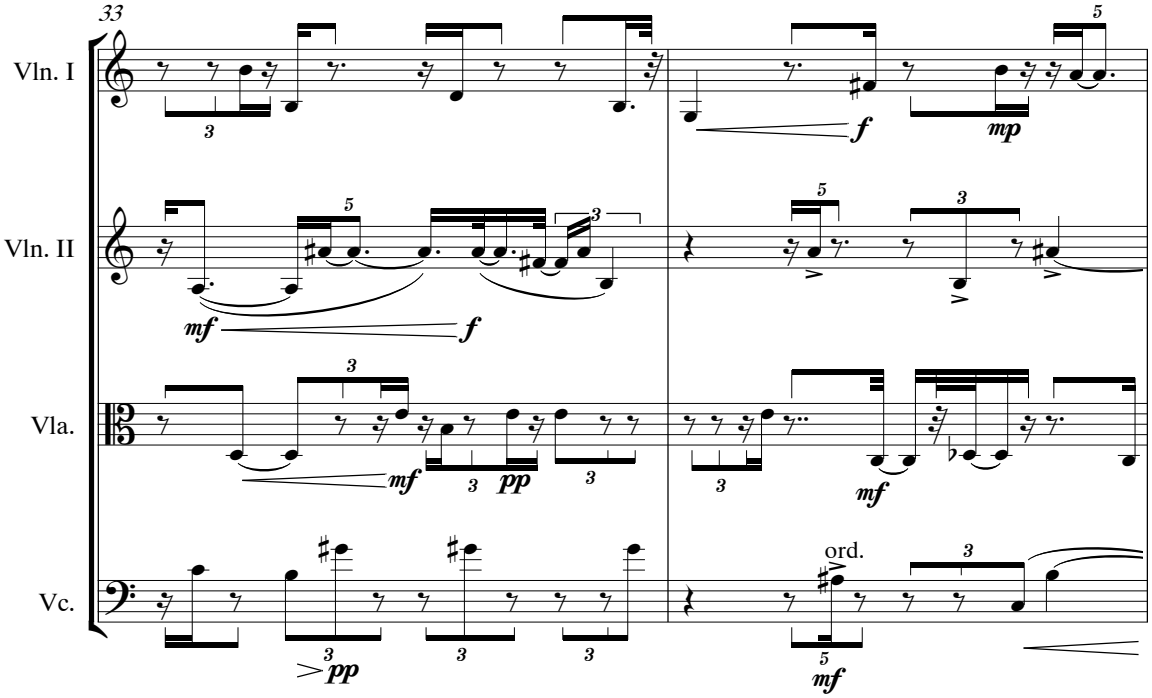

20
Vln. I
Vln. II
Vla.
Vc.
mf
mf
mp
f
f
p
p

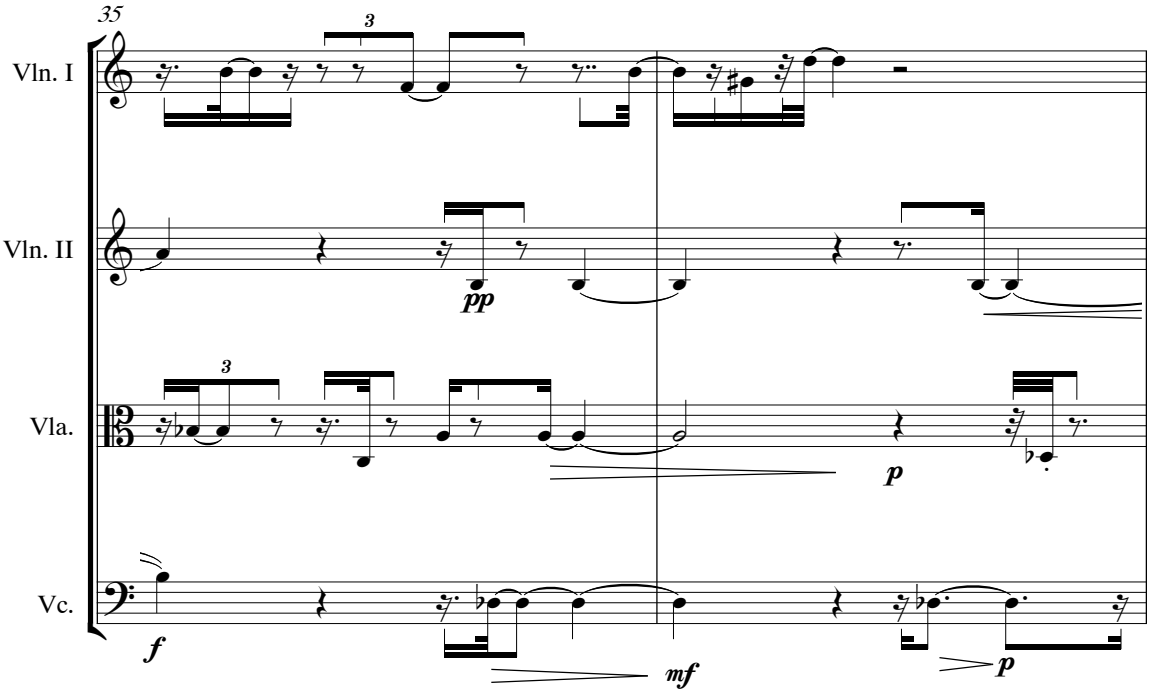

22
Vln. I
Vln. II
Vla.
Vc.
mf
pp
mf
p
mp
pp
mp
pp
mp
p

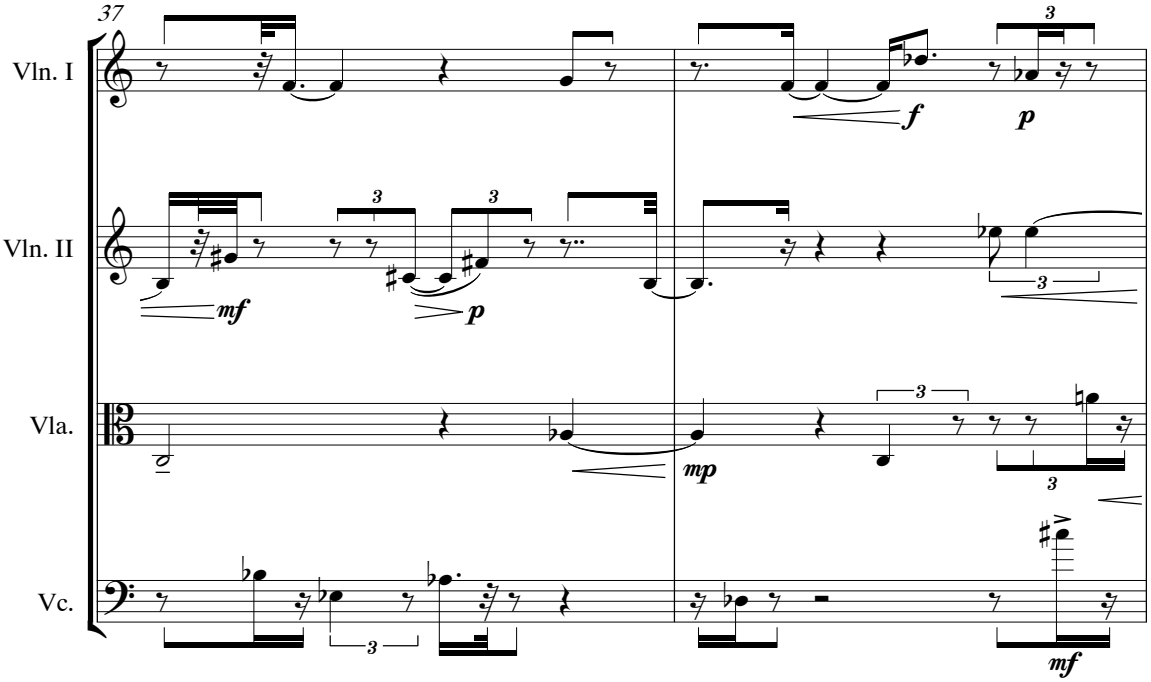

24
Vln. I
Vln. II
Vla.
Vc.
mp
mf
pp
p

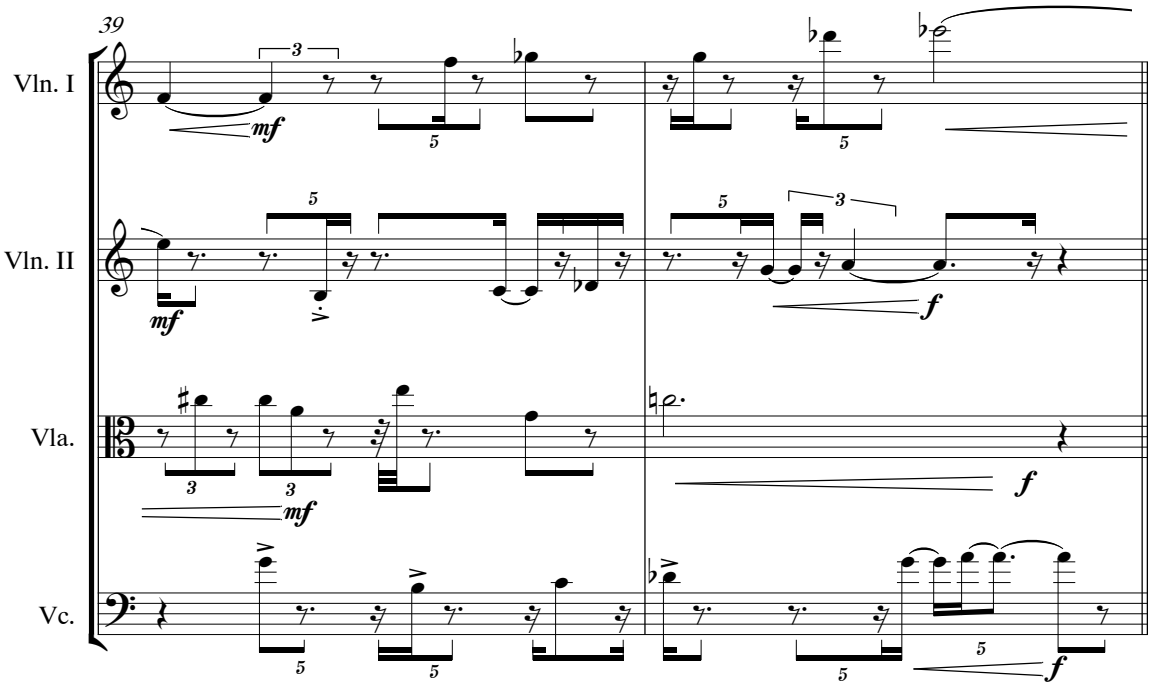

C
27
Vln. I
Vln. II
Vla.
Vc.
p
mp
mf
pp
f

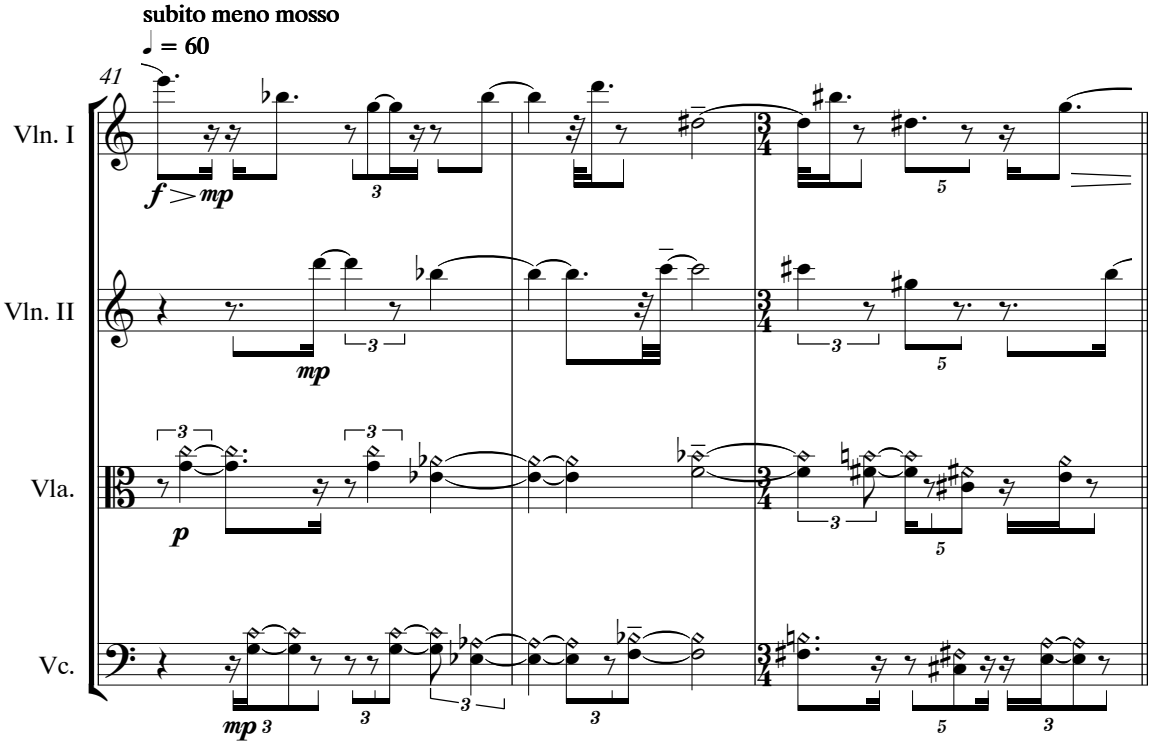

30
Vln. I
Vln. II
Vla.
Vc.
flaut.

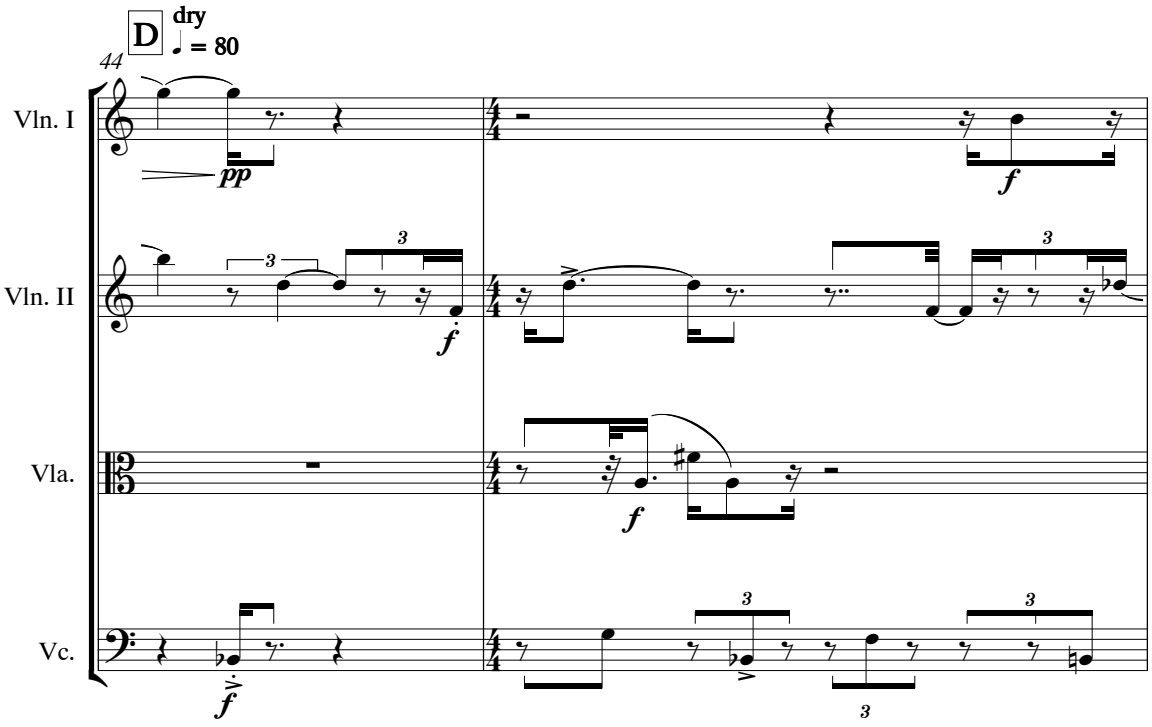

33
Vln. I
Vln. II
Vla.
Vc.
ord.

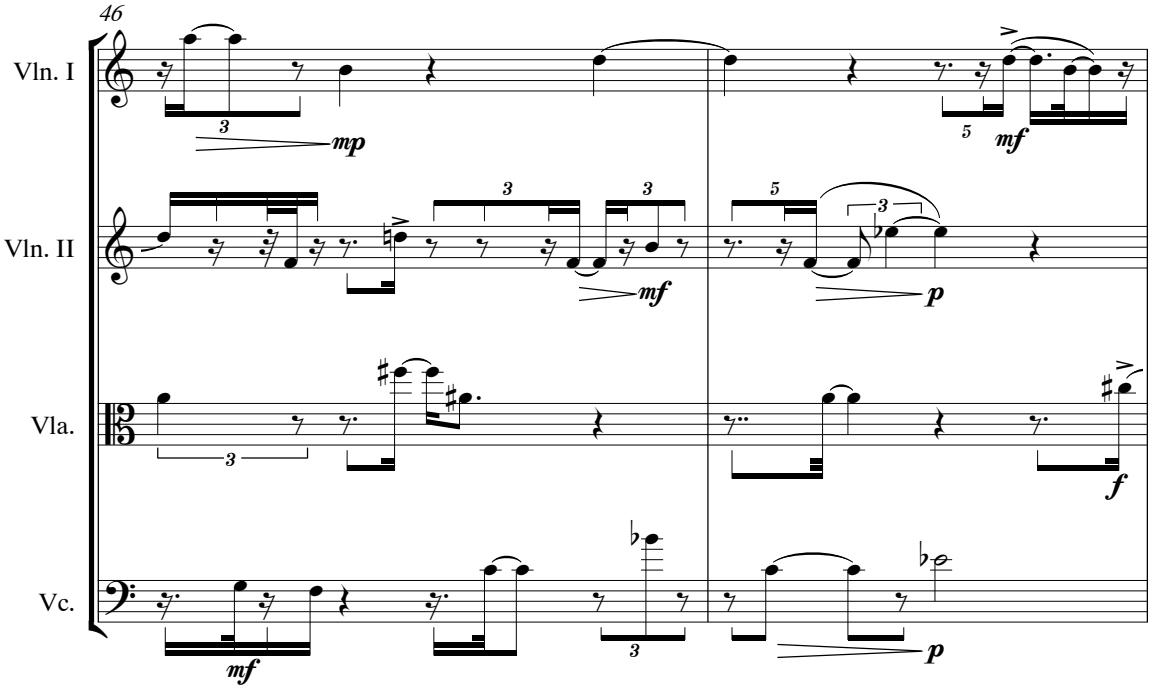

35
Vln. I
Vln. II
Vla.
Vc.
pp
p
f
mf
p

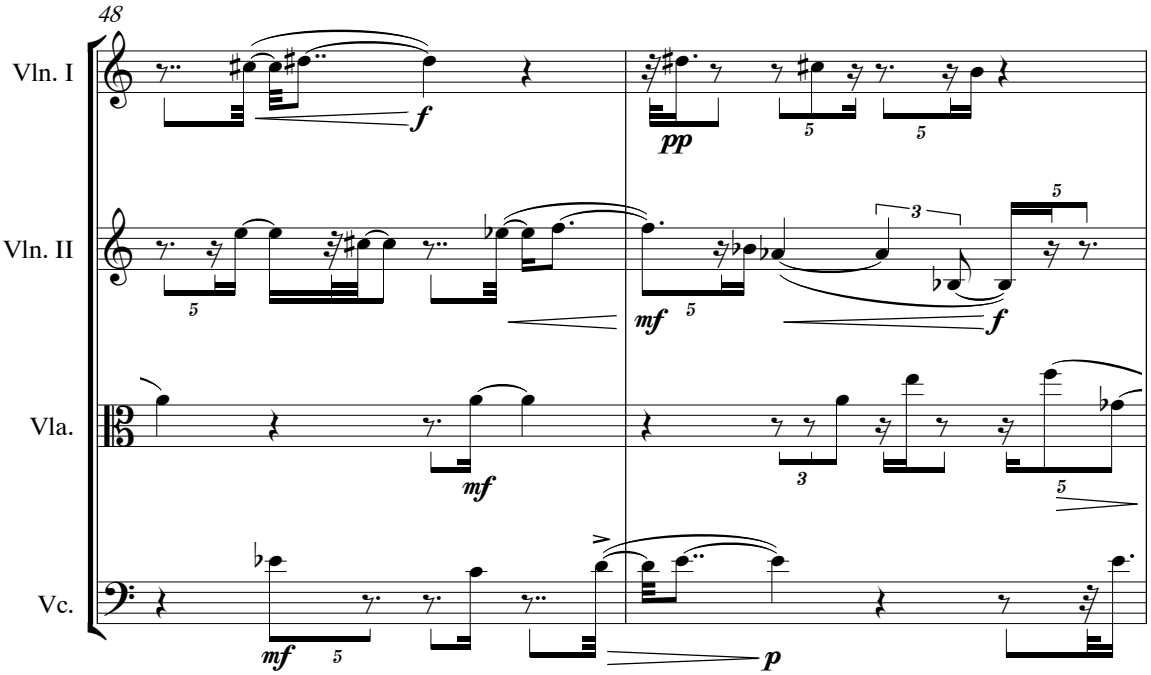

37
Vln. I
Vln. II
Vla.
Vc.
f
p
mf
p
mp
mf

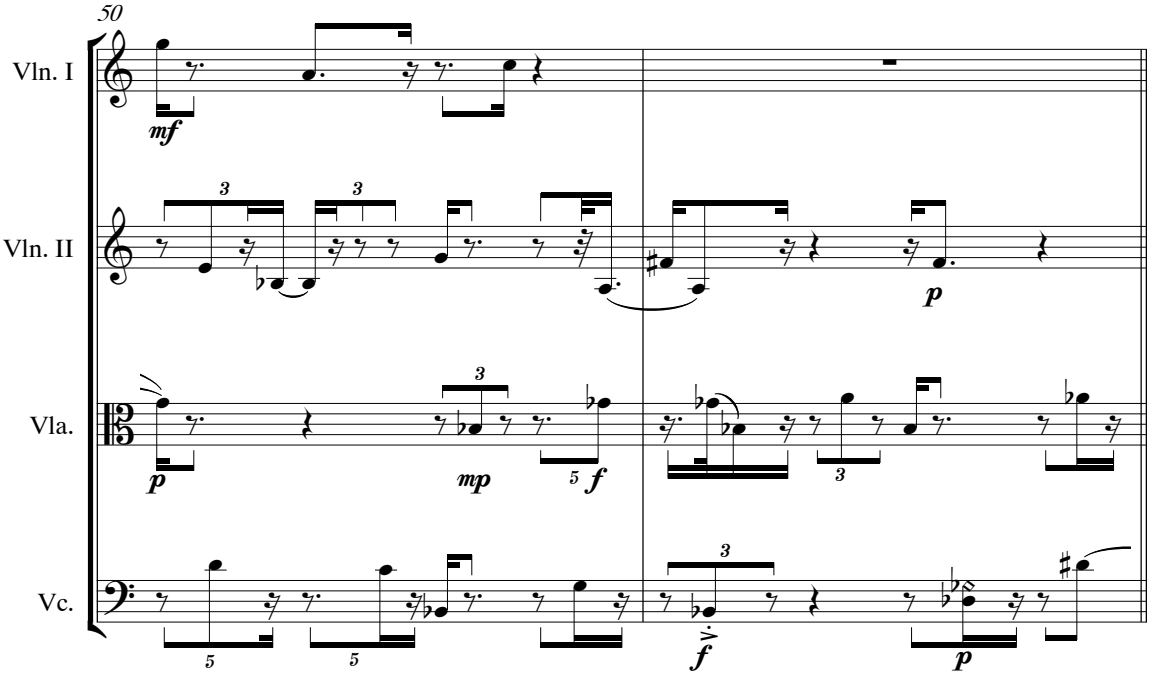

39
Vln. I
Vln. II
Vla.
Vc.
mf
f

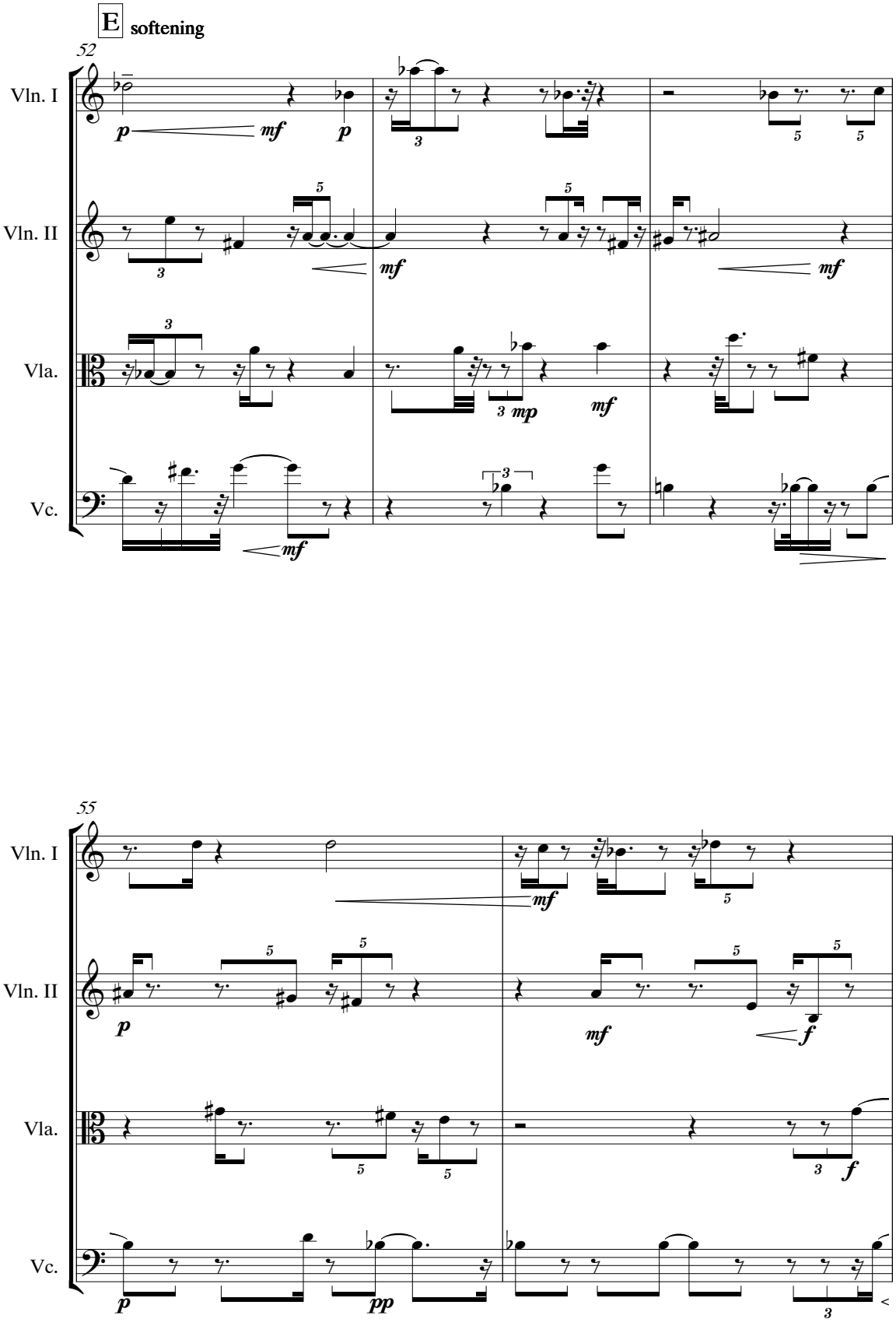

subito meno mosso
♩ = 60
41
Vln. I
Vln. II
Vla.
Vc.
f > mp
mp
p

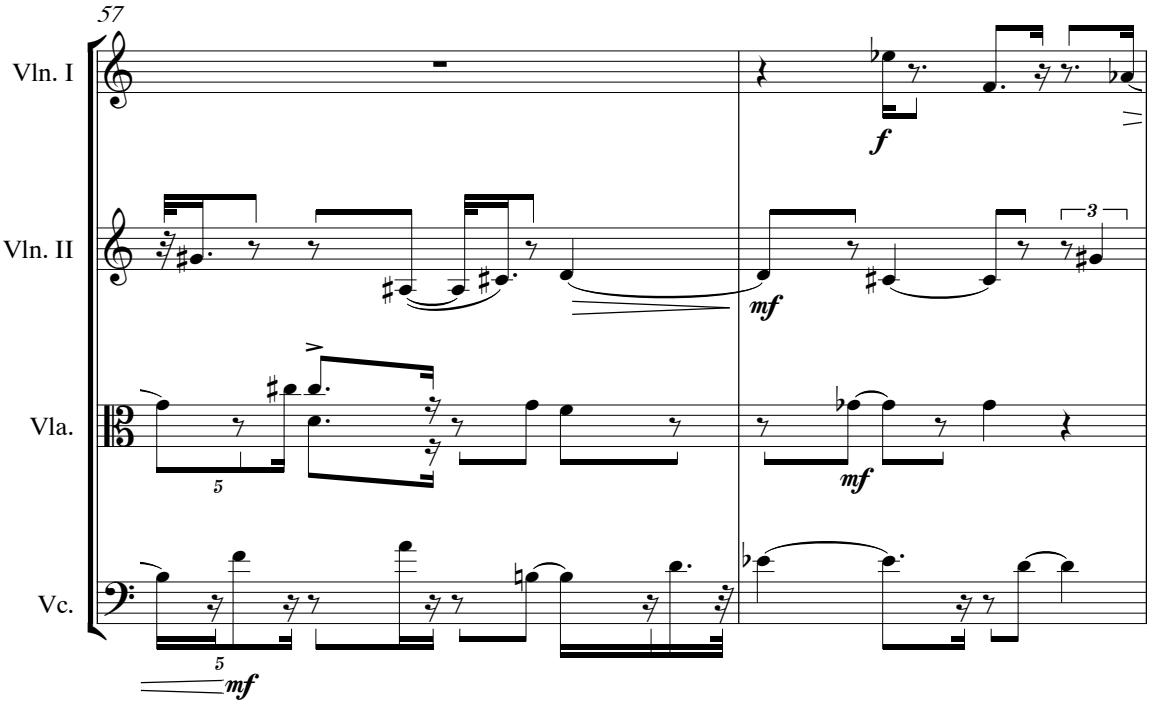

D
dry
♩ = 80
44
Vln. I
Vln. II
Vla.
Vc.
pp
f
f
f
f
3
3
3
3
3
3

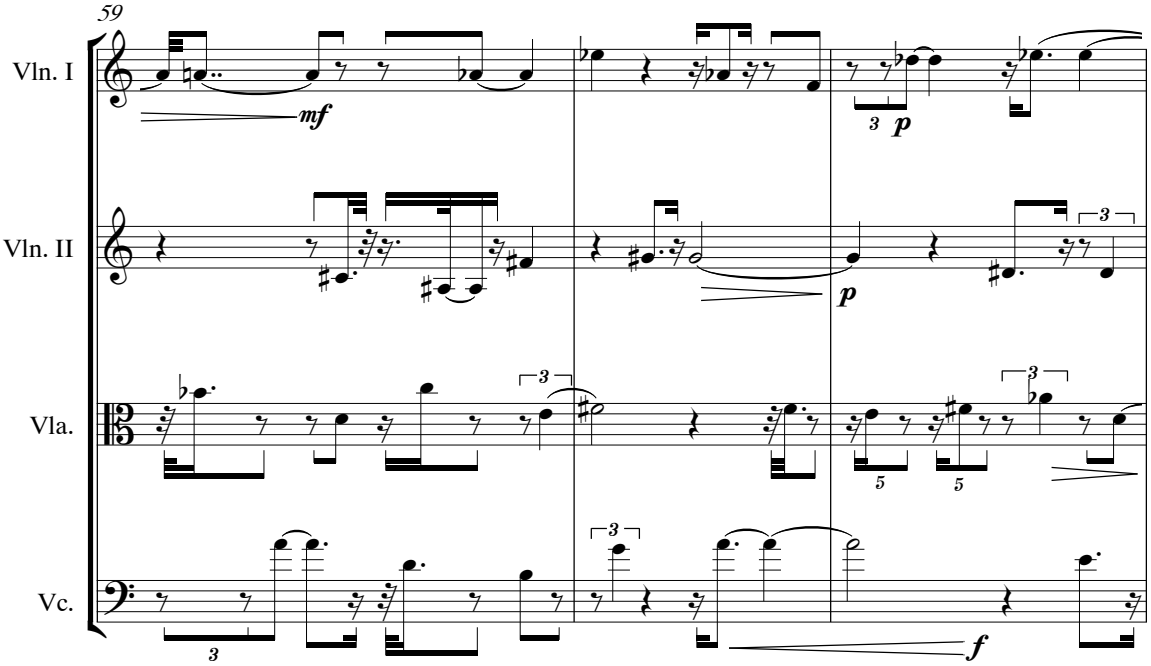

46
Vln. I
Vln. II
Vla.
Vc.
mp
mf
mf
p
f
mf
p
3
3
3
3
5
5

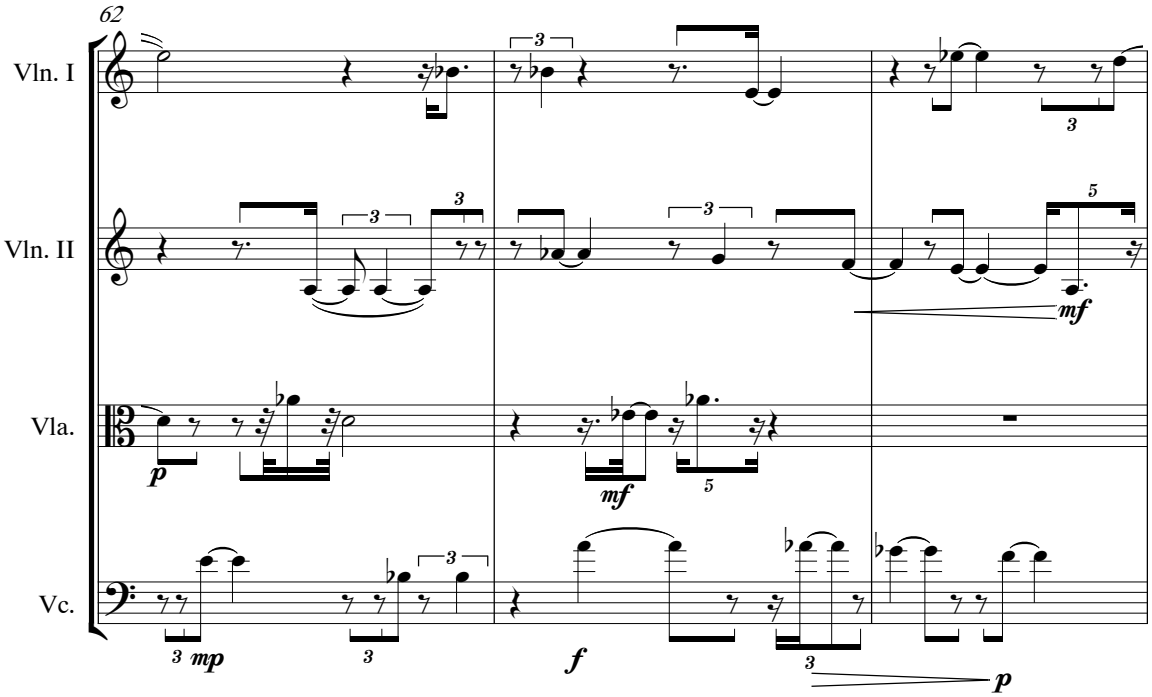

48
Vln. I
Vln. II
Vla.
Vc.
f
pp
mf
f
mf
mf
p

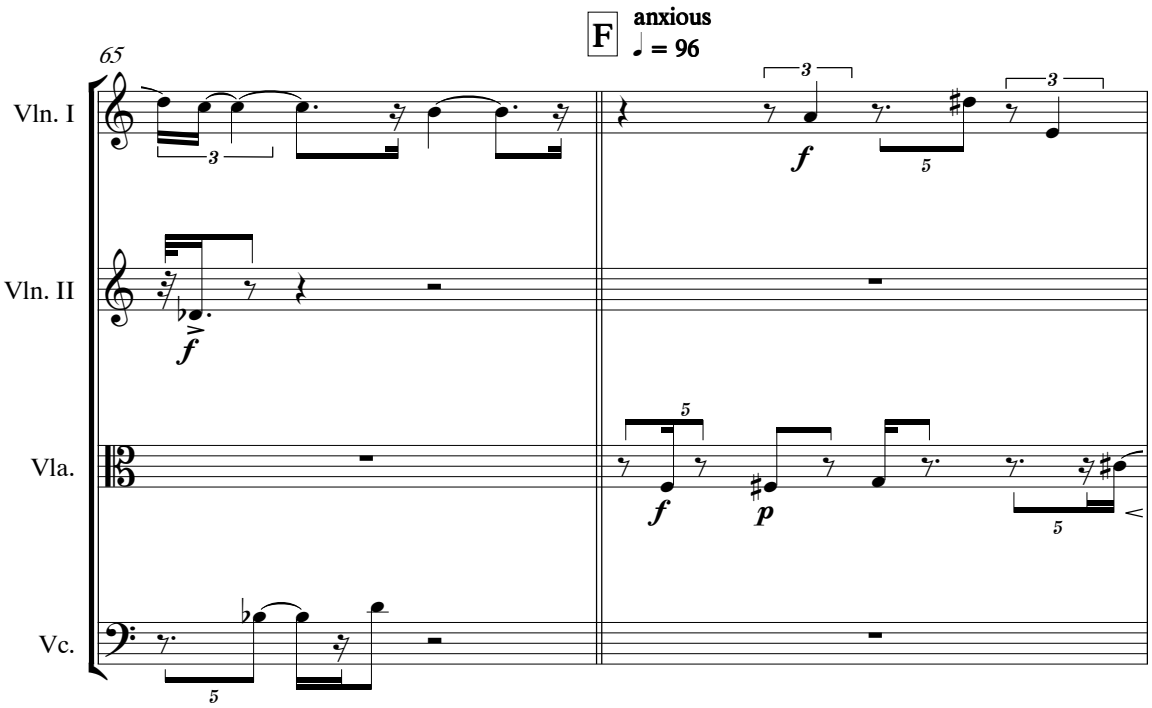

50
Vln. I
Vln. II
Vla.
Vc.
mf
p
p
mp
f
f
p

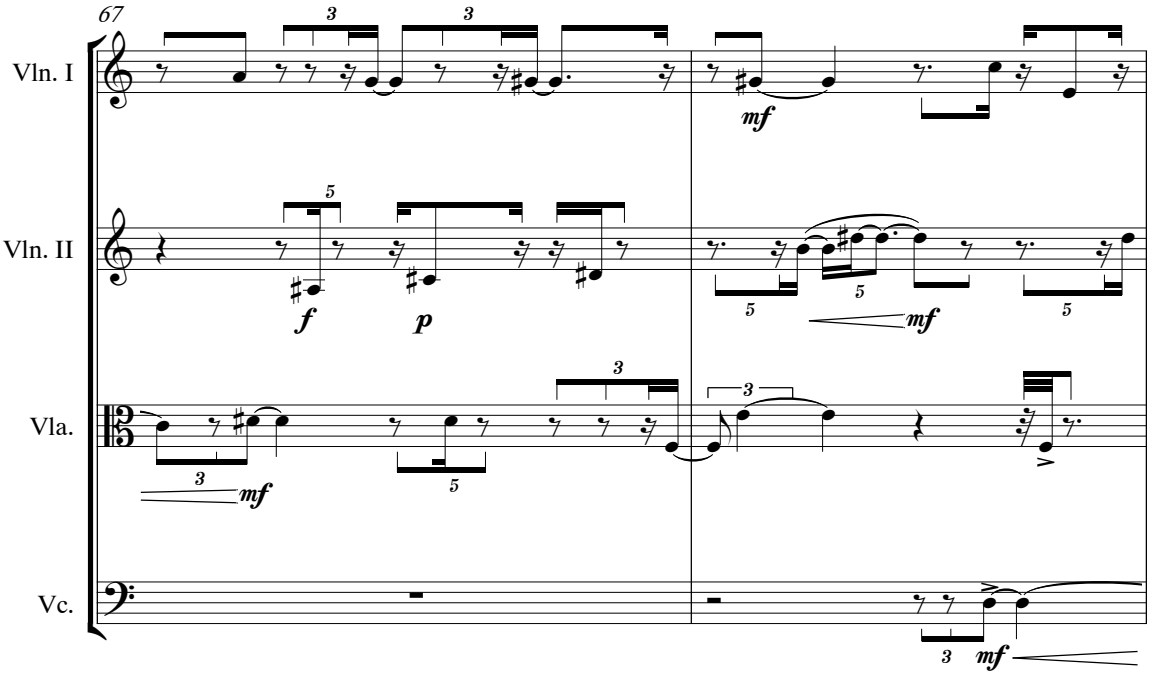

E softening
52
Vln. I
Vln. II
Vla.
Vc.
55
Vln. I
Vln. II
Vla.
Vc.

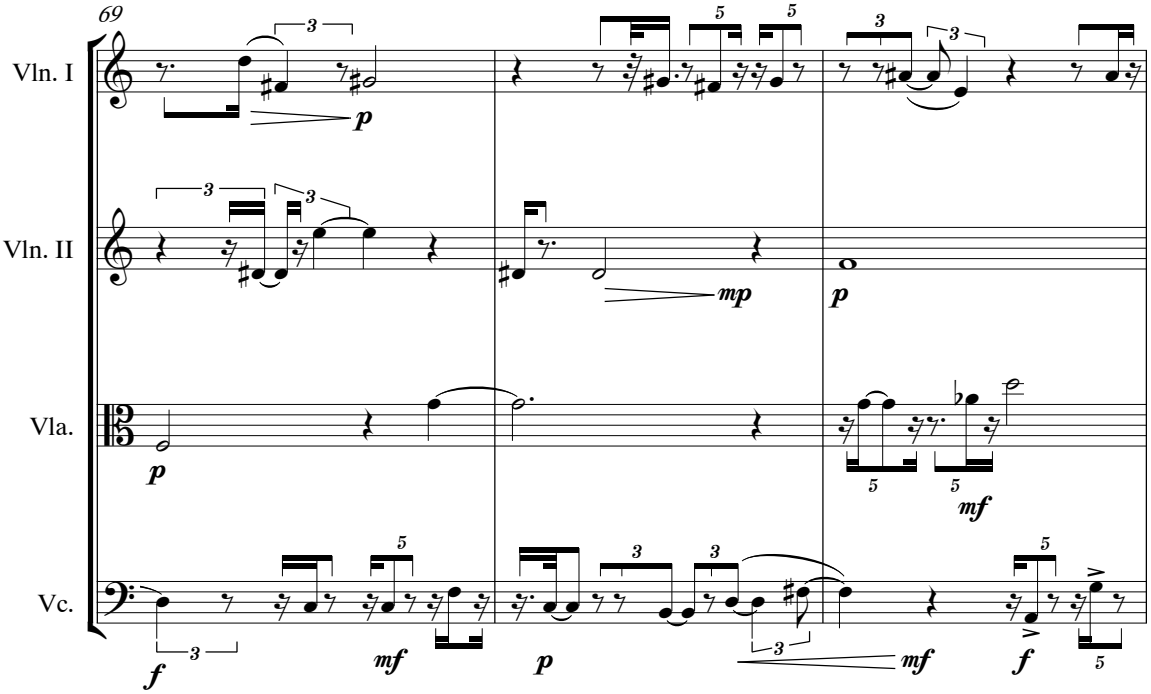

57
Vln. I
Vln. II
Vla.
Vc.
f
mf
mf
mf
3
5
5

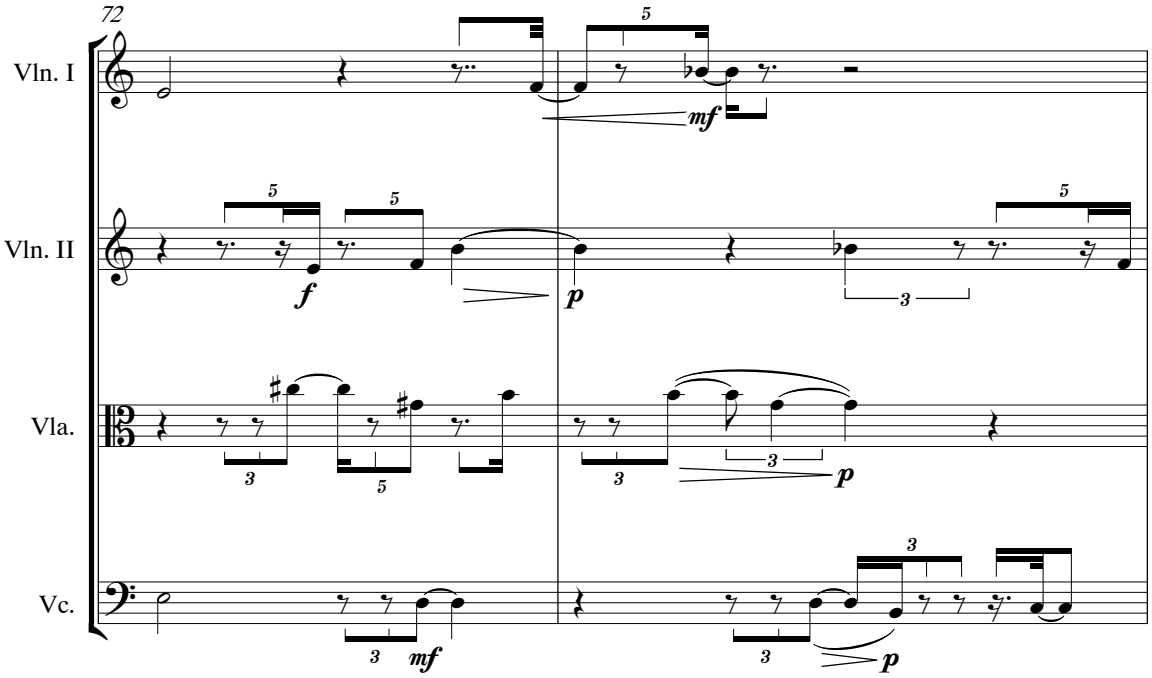

59
Vln. I
Vln. II
Vla.
Vc.
mf
3 p
p
f
3
3
3
3
5
5
3

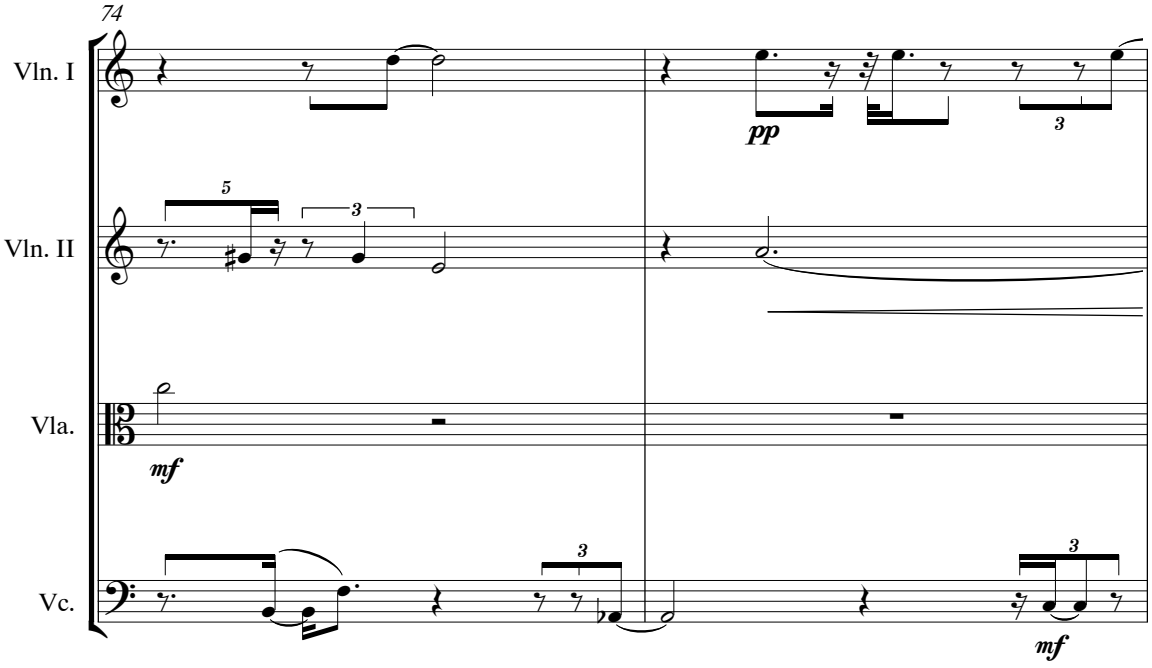

62
Vln. I
Vln. II
Vla.
Vc.
mp
f
mf
p

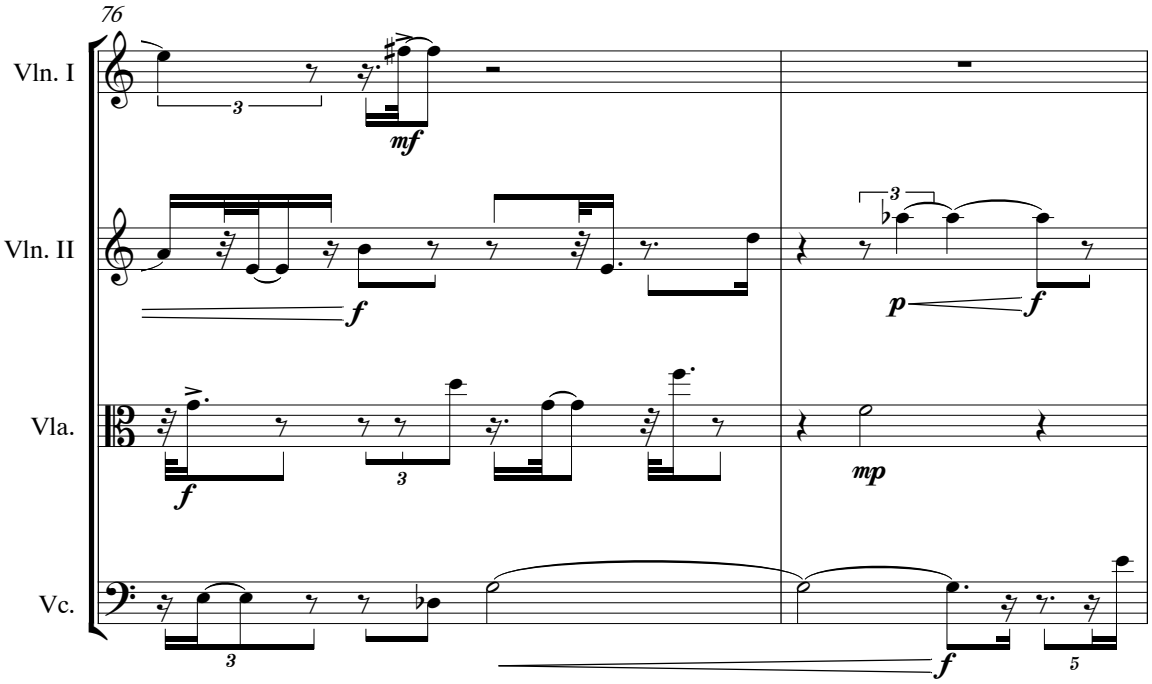

F
anxious
♩ = 96
65
Vln. I
Vln. II
Vla.
Vc.
f
p

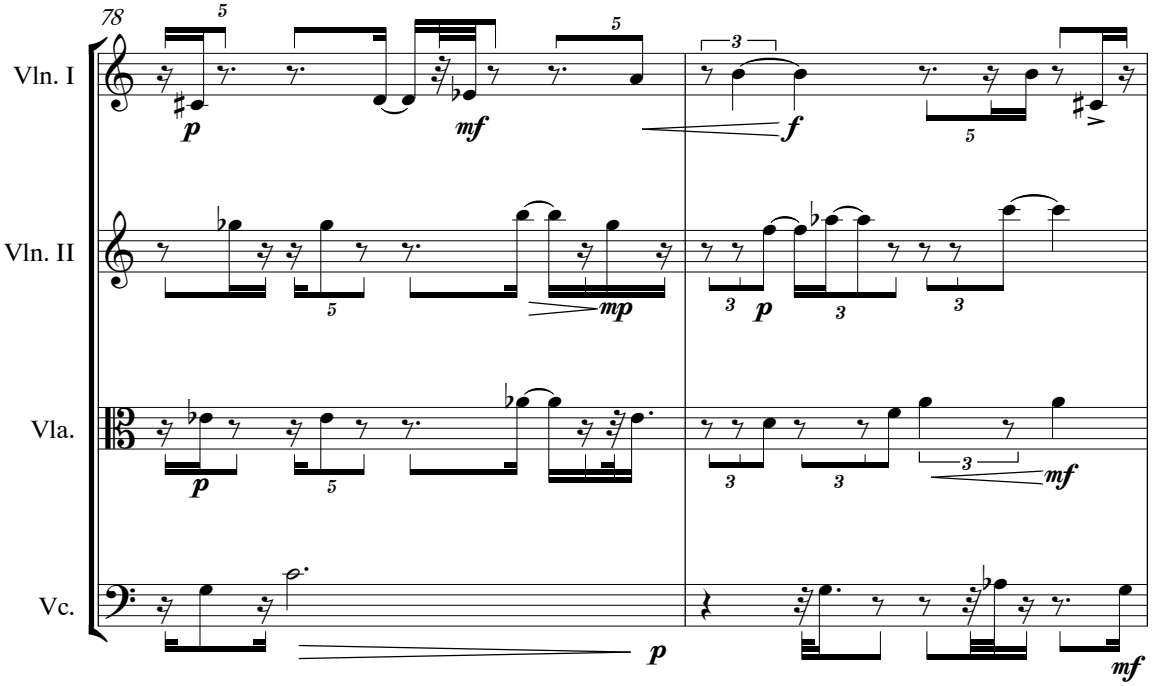

67
Vln. I
Vln. II
Vla.
Vc.
mf
f
p
mf
mf
mf

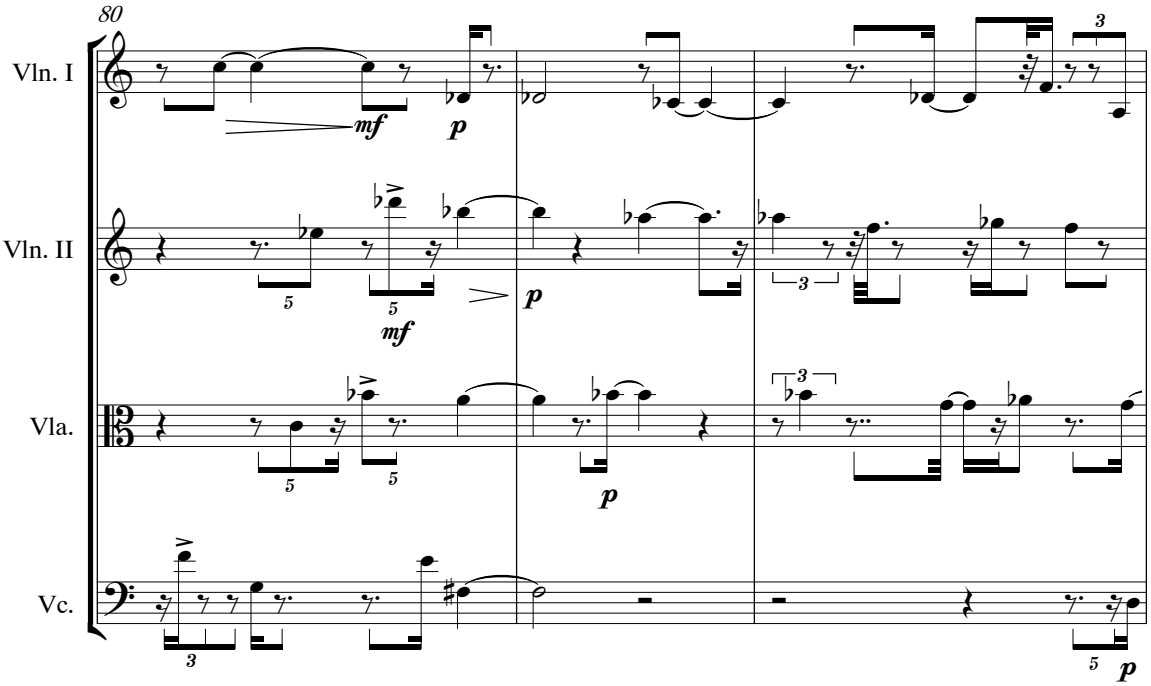

69
Vln. I
Vln. II
Vla.
Vc.
p
mp
p
p
mf
f
mf
p
mf
f

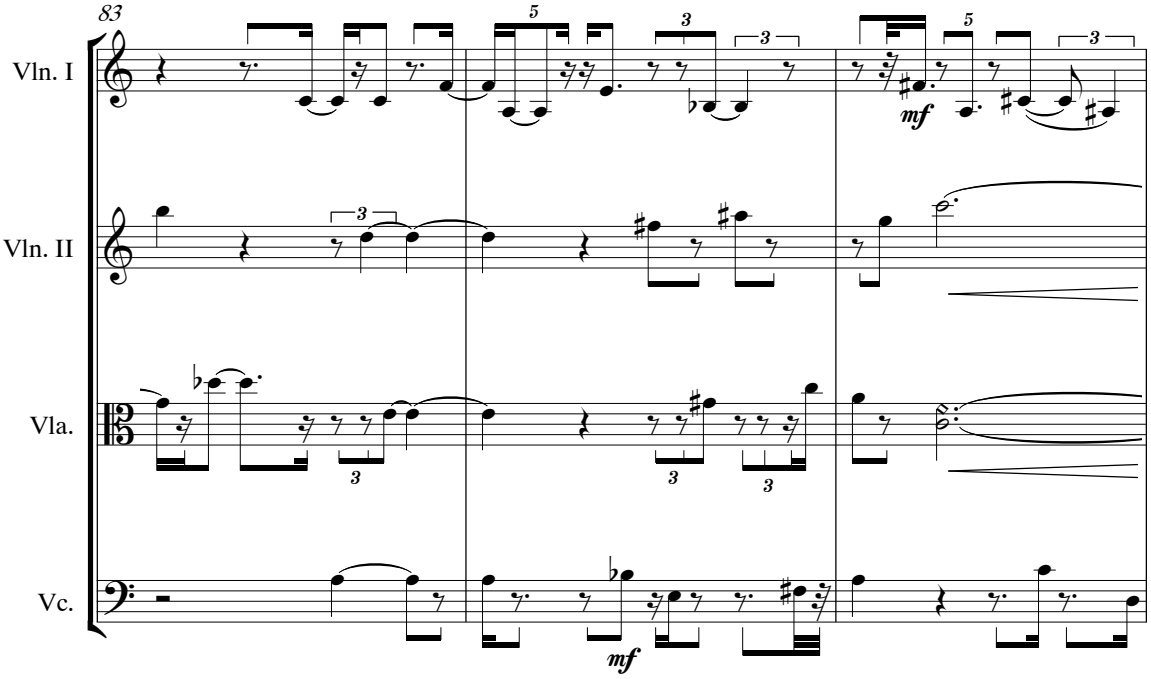

72
Vln. I
Vln. II
Vla.
Vc.
mf
f
p
mf
p
p

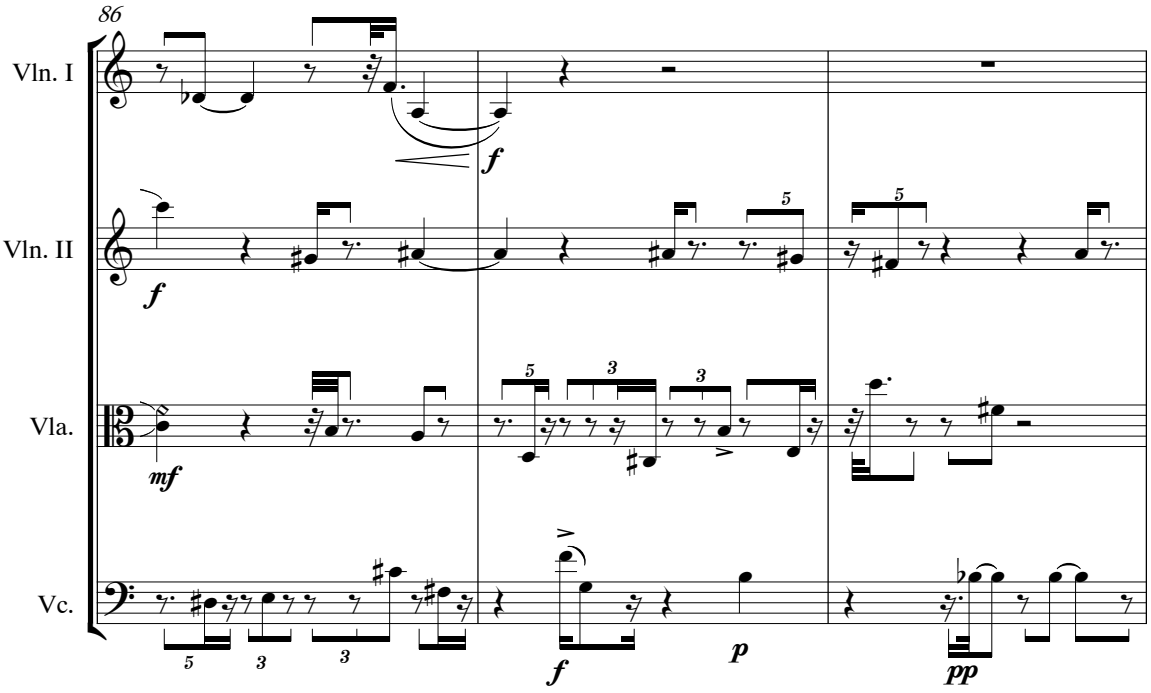

74
Vln. I
Vln. II
Vla.
Vc.
pp
mf
mf

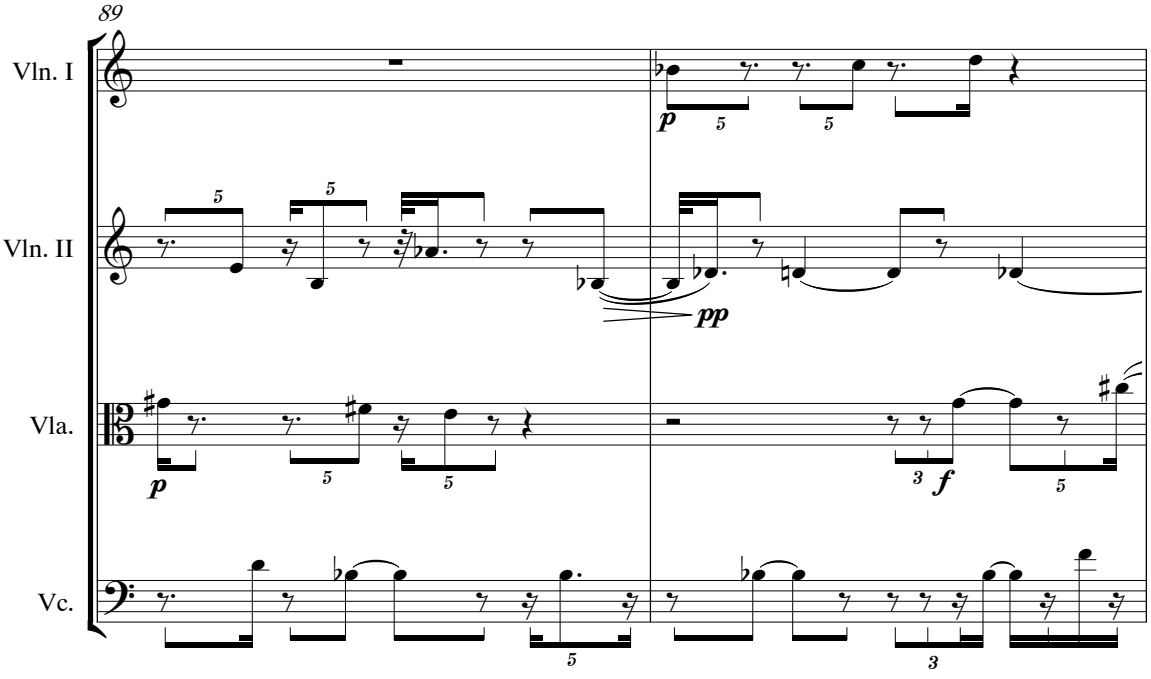

76
Vln. I
Vln. II
Vla.
Vc.

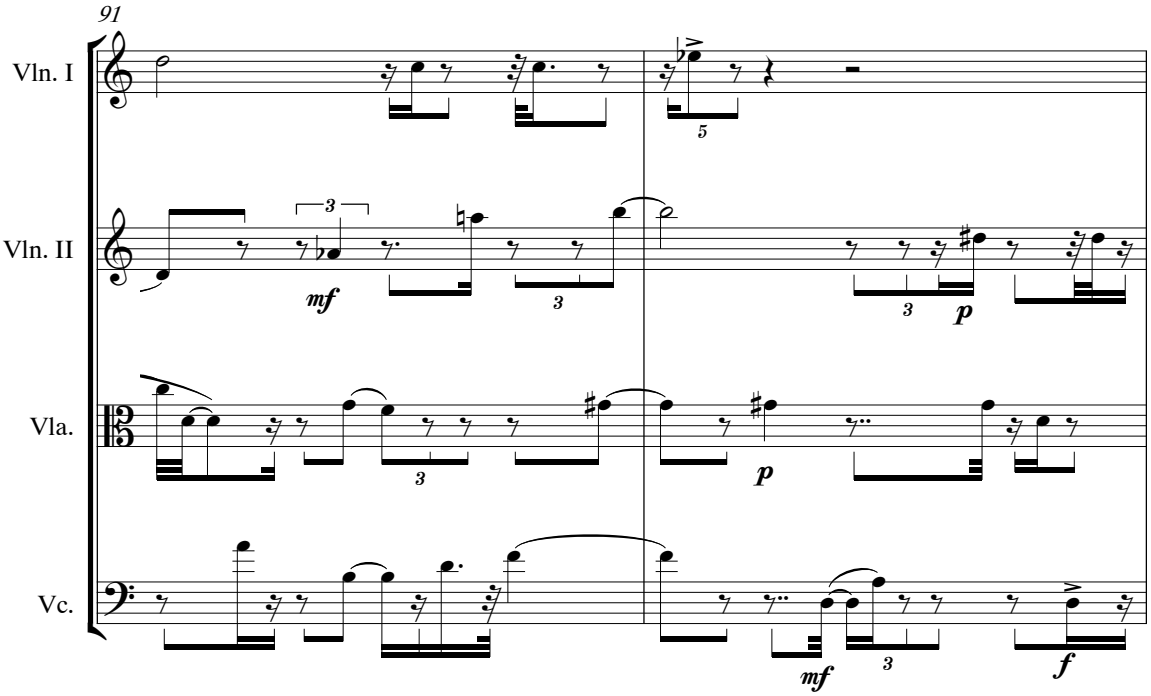

78
Vln. I
Vln. II
Vla.
Vc.

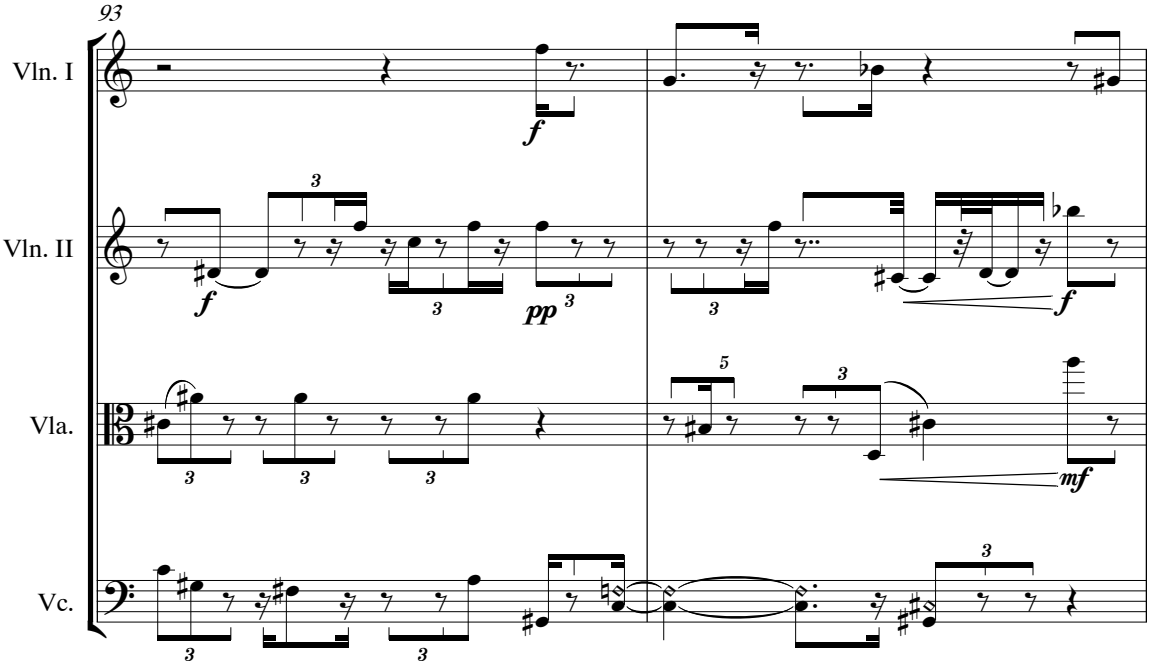

80
Vln. I
Vln. II
Vla.
Vc.
mf
p
mf
p
p
p

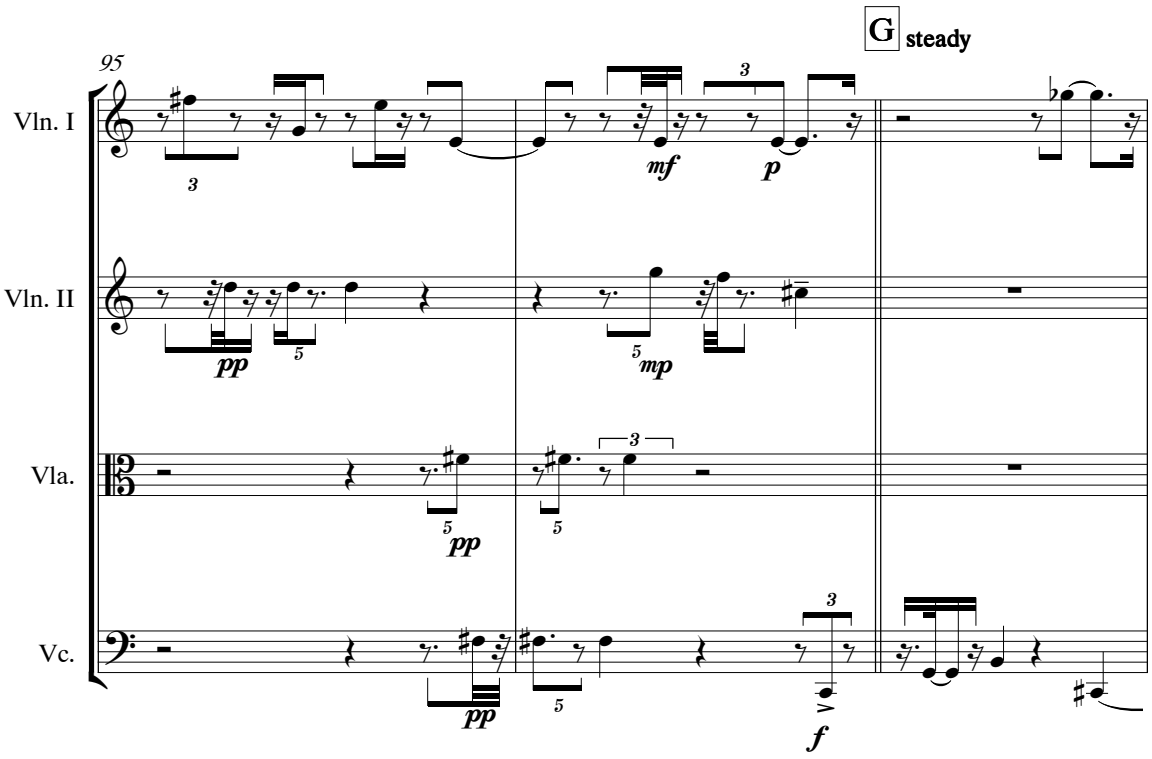

83
Vln. I
Vln. II
Vla.
Vc.
mf
mf

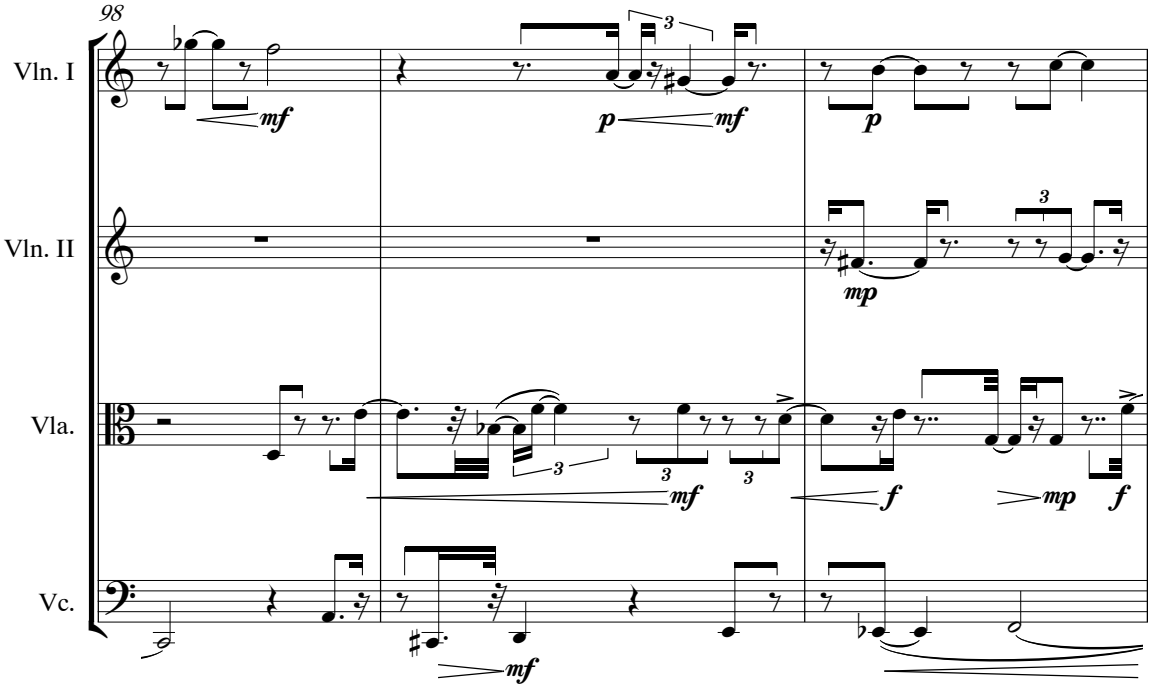

86
Vln. I
Vln. II
Vla.
Vc.
f
f
mf
f
p
pp

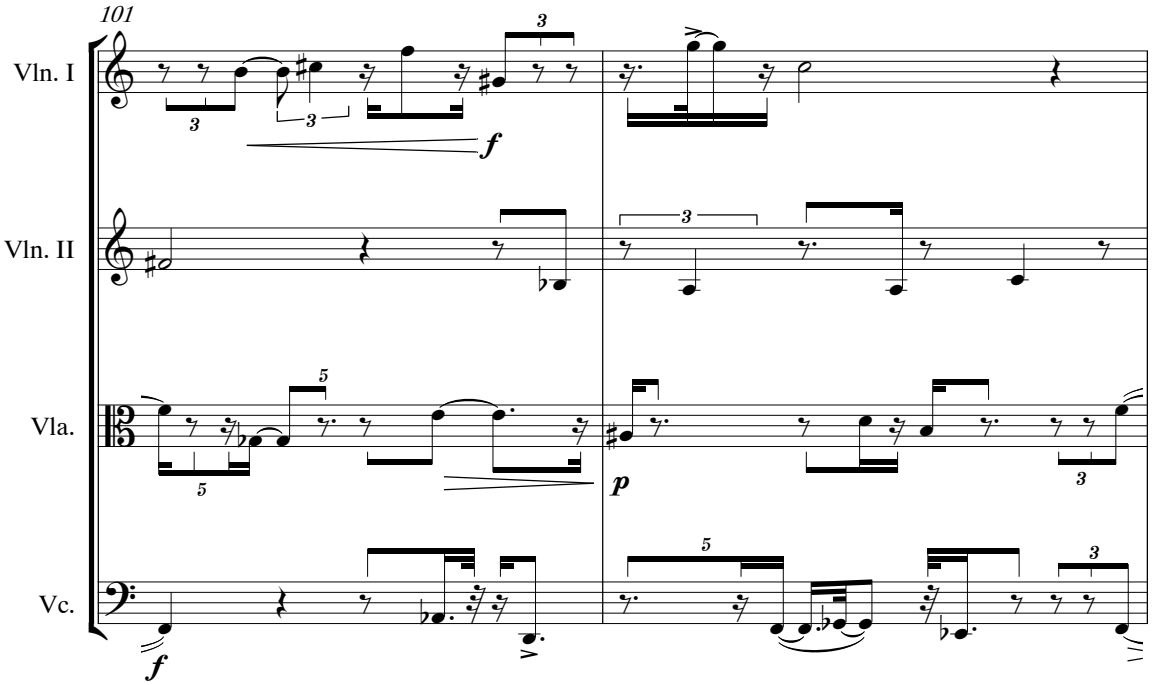

89
Vln. I
Vln. II
Vla.
Vc.
p
pp
p
f

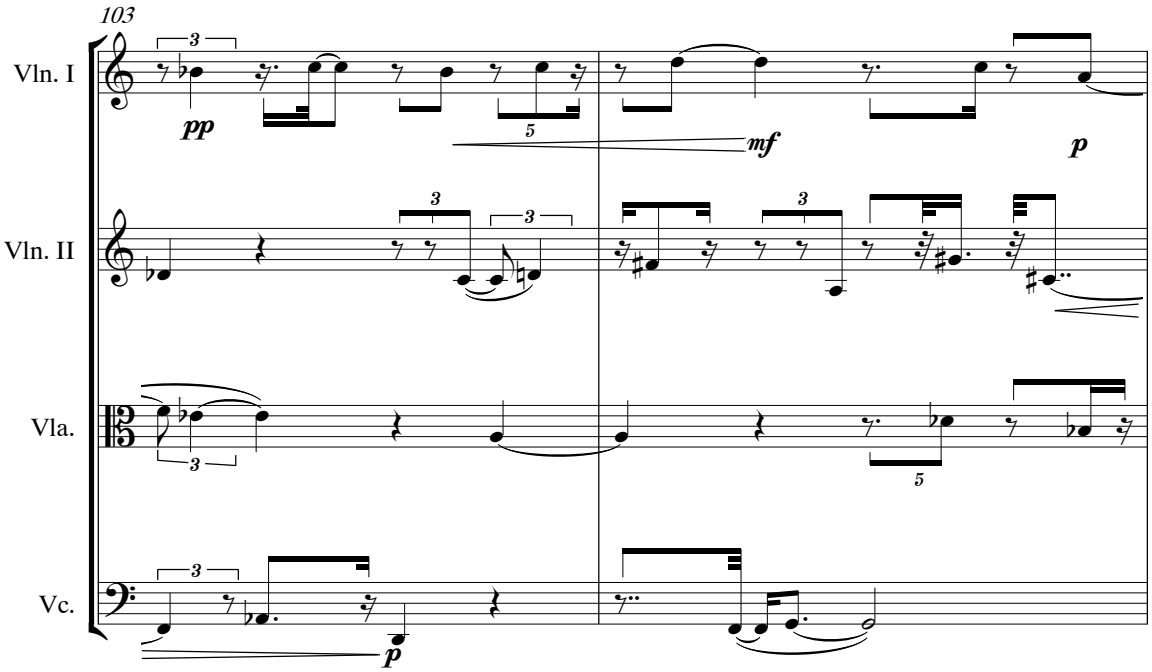

91
Vln. I
Vln. II
Vla.
Vc.
mf
p
p
mf
f

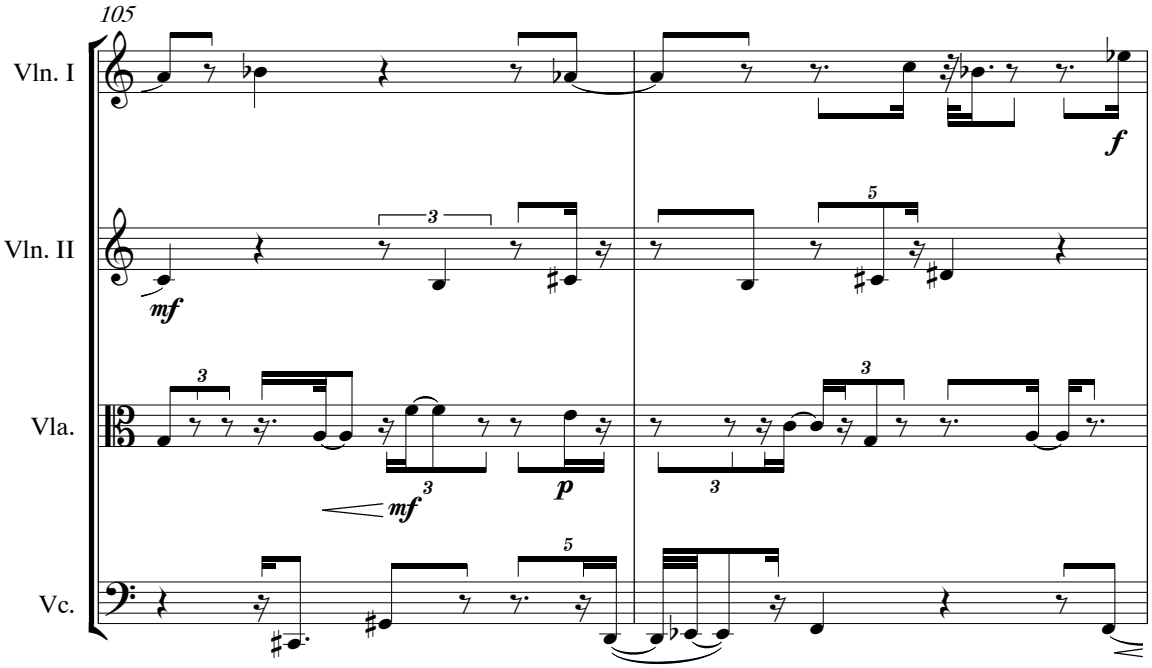

93
Vln. I
Vln. II
Vla.
Vc.
f
f
pp
f
mf

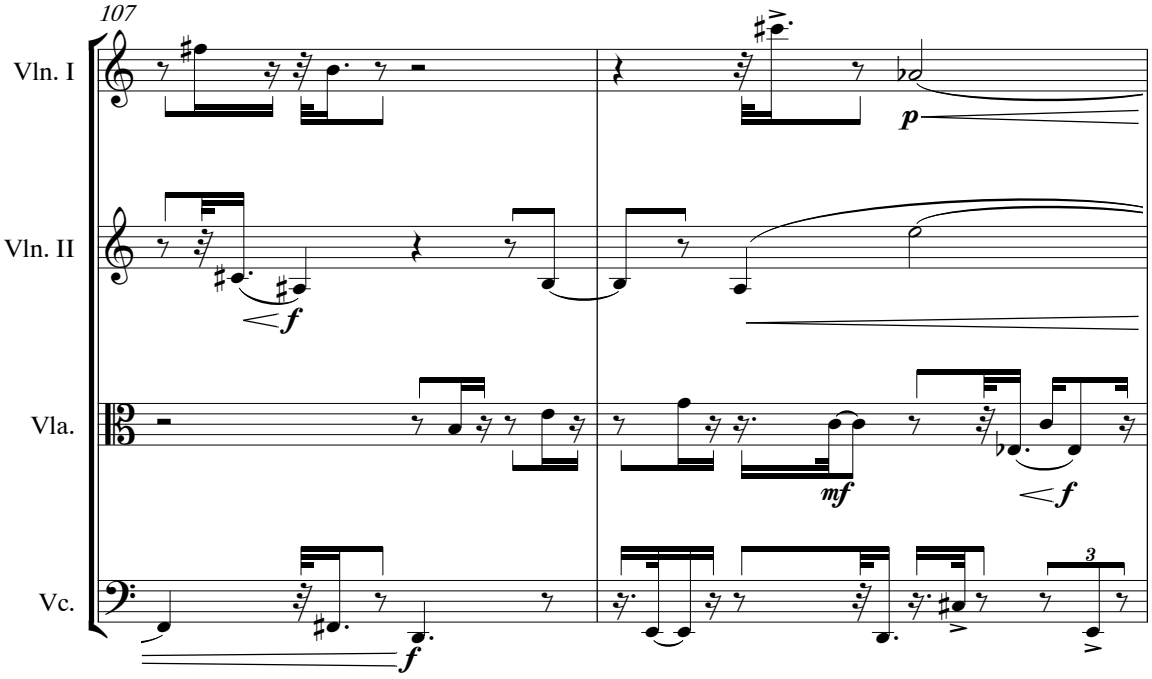

G steady
95
Vln. I
Vln. II
Vla.
Vc.
mf
p
pp
mp
f

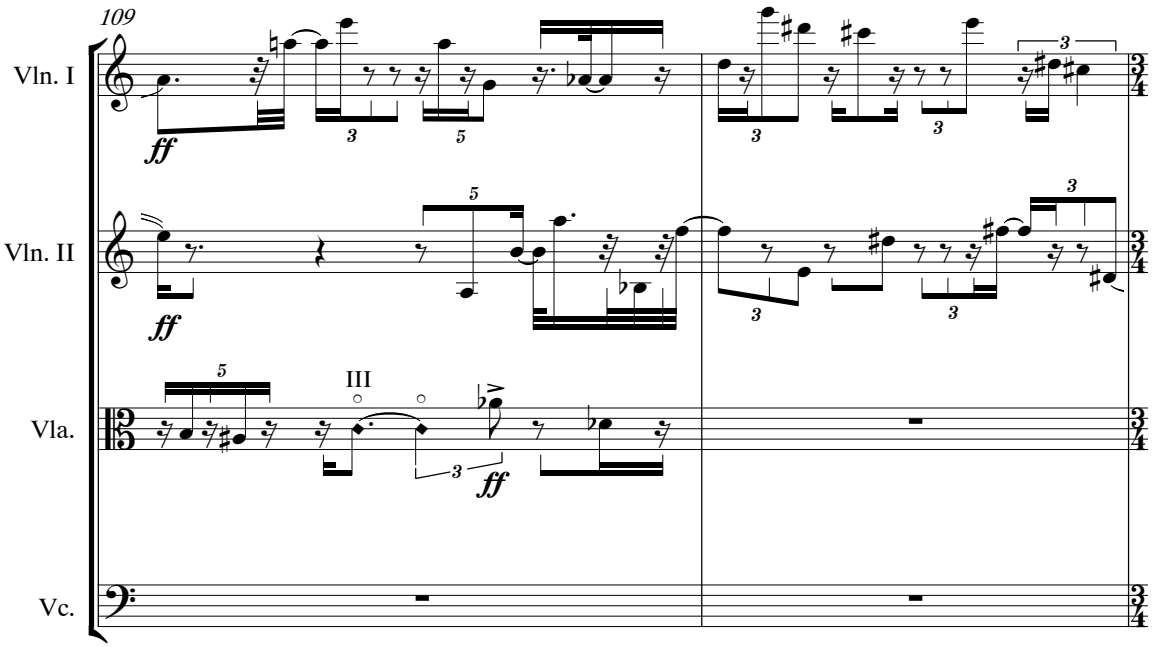

98
Vln. I
Vln. II
Vla.
Vc.
mf
p
mp
f

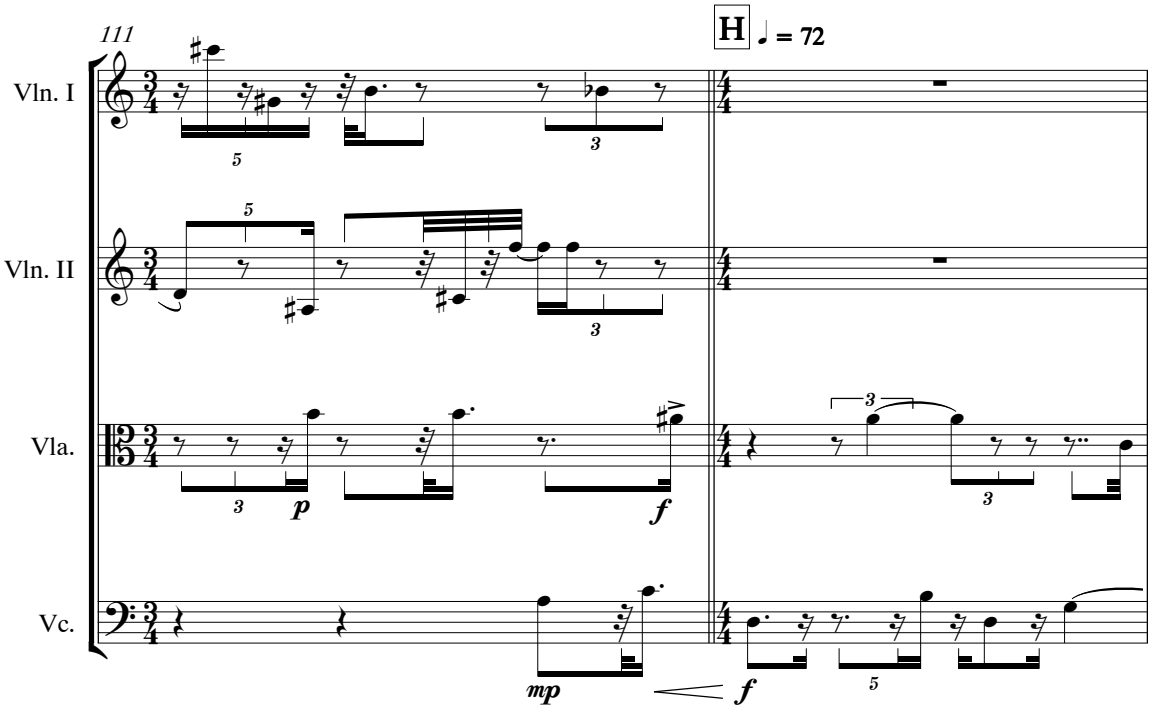

101
Vln. I
Vln. II
Vla.
Vc.
f
p
f

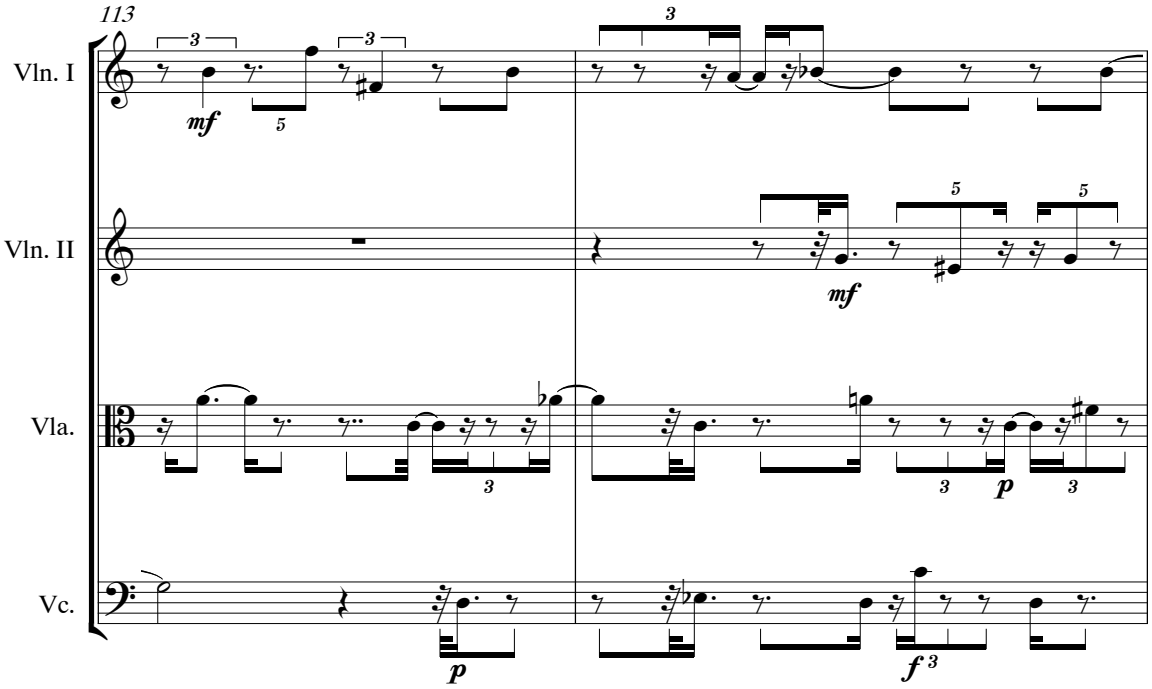

103
Vln. I
Vln. II
Vla.
Vc.
pp
mf
p
p

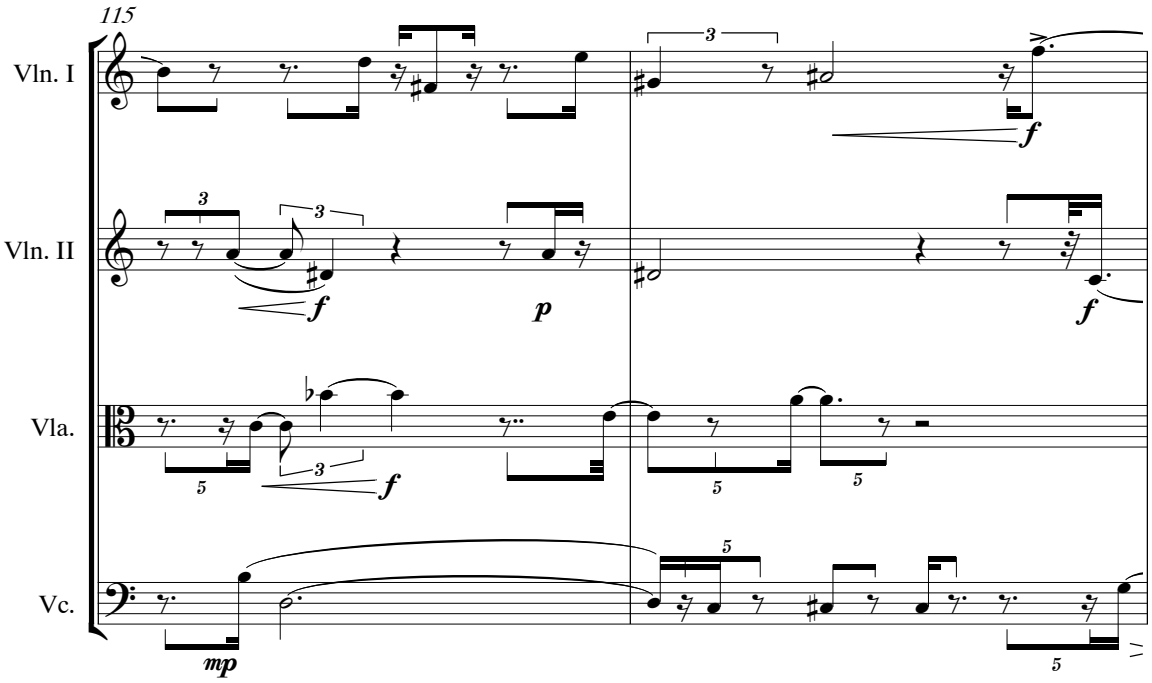

105
Vln. I
Vln. II
Vla.
Vc.
mf
p
f

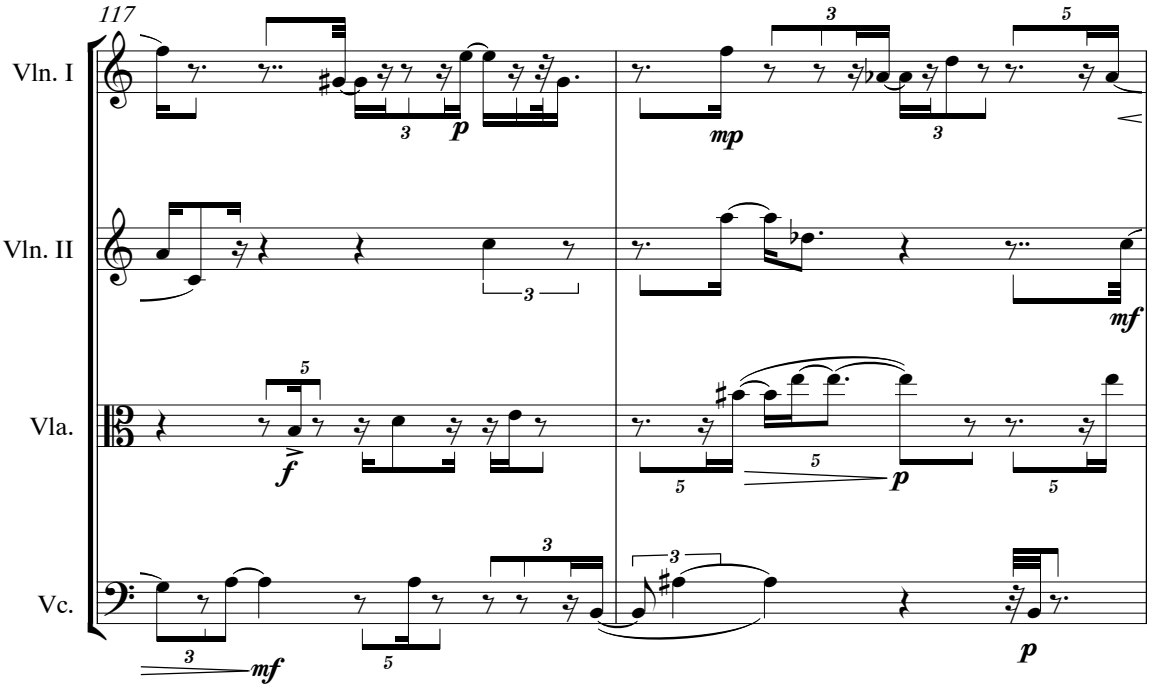

107
Vln. I
Vln. II
Vla.
Vc.
p
f
mf

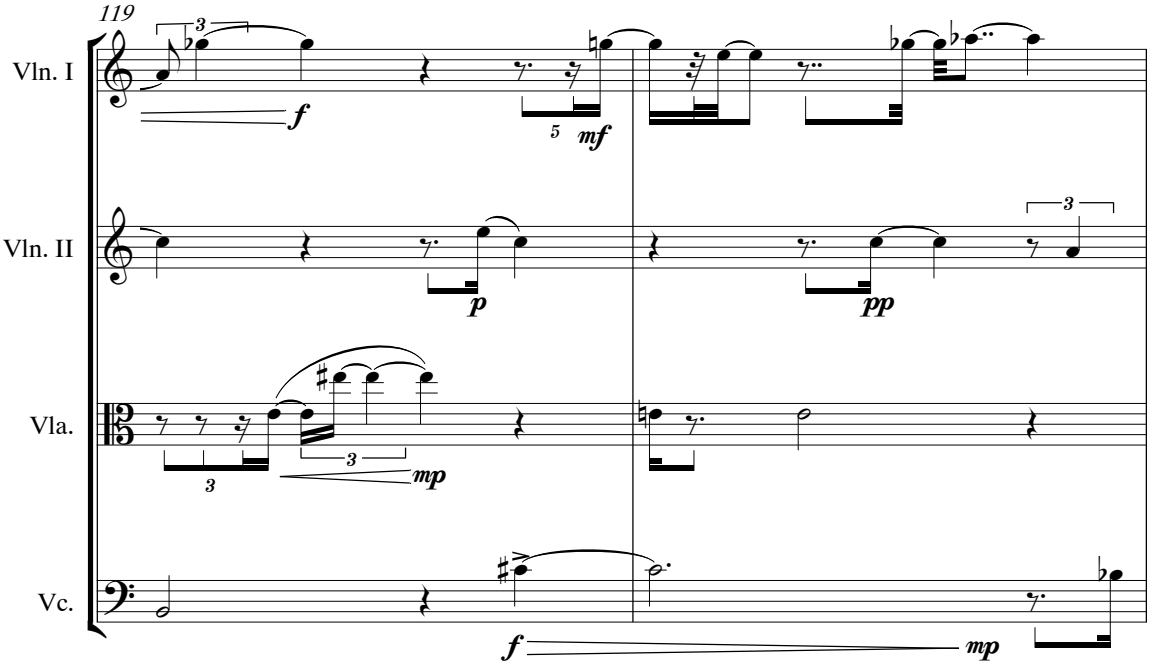

109
Vln. I
Vln. II
Vla.
Vc.
III

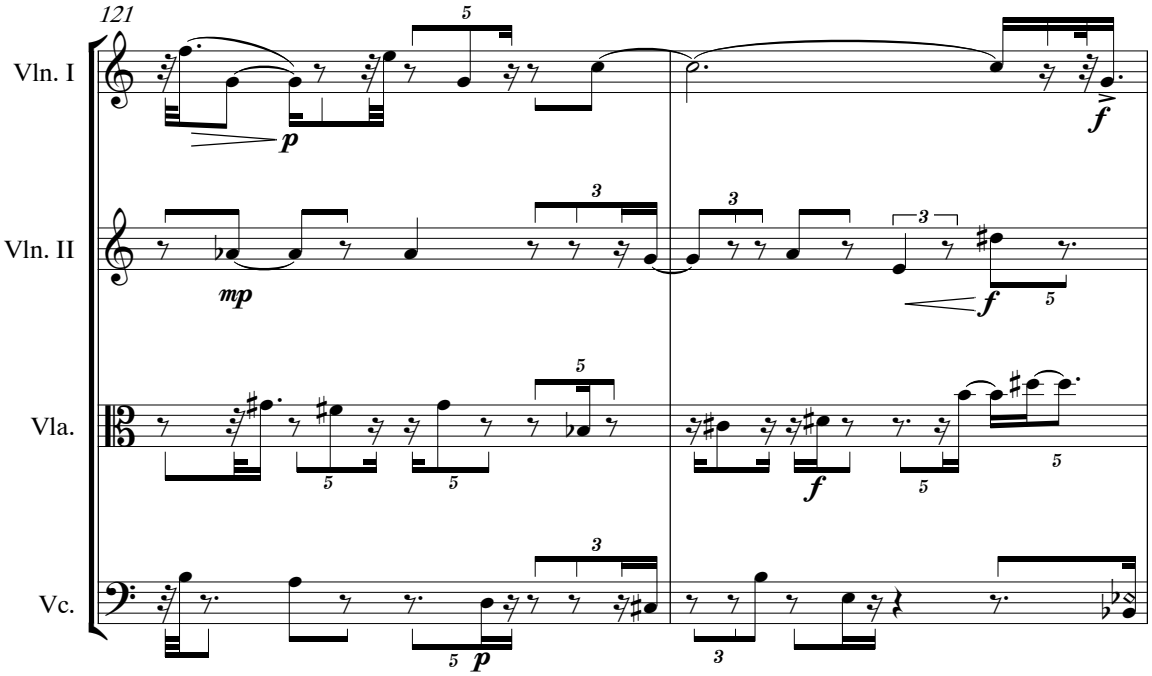

111
H
♩ = 72
Vln. I
Vln. II
Vla.
Vc.

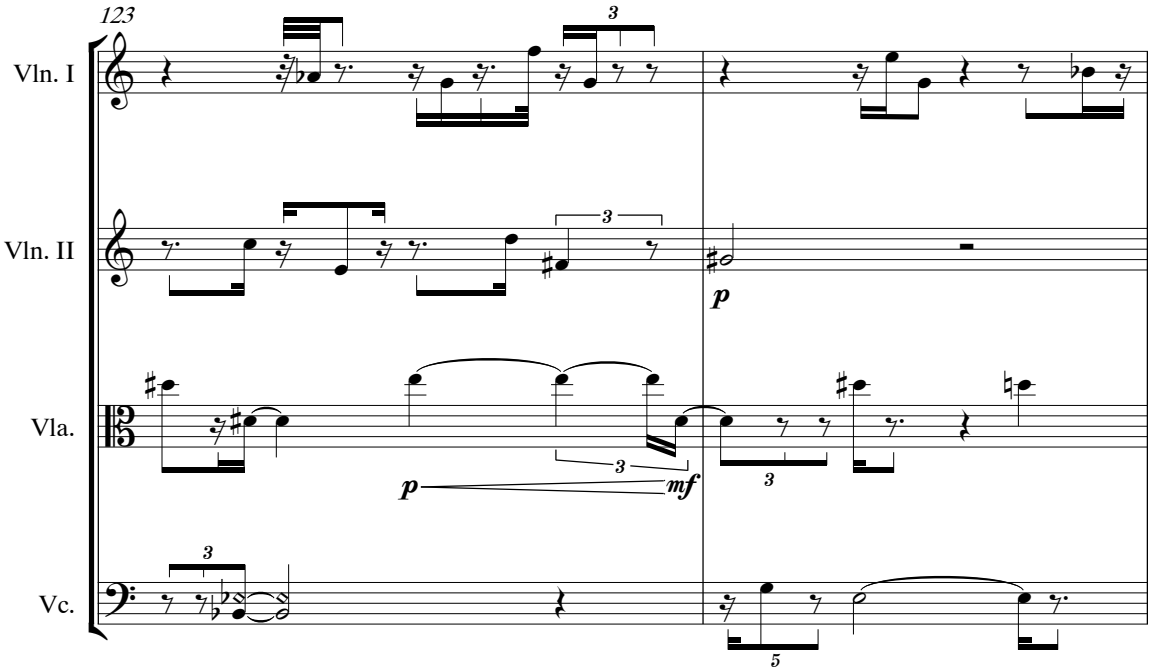

113
Vln. I
Vln. II
Vla.
Vc.
mf
mf
p
p
f

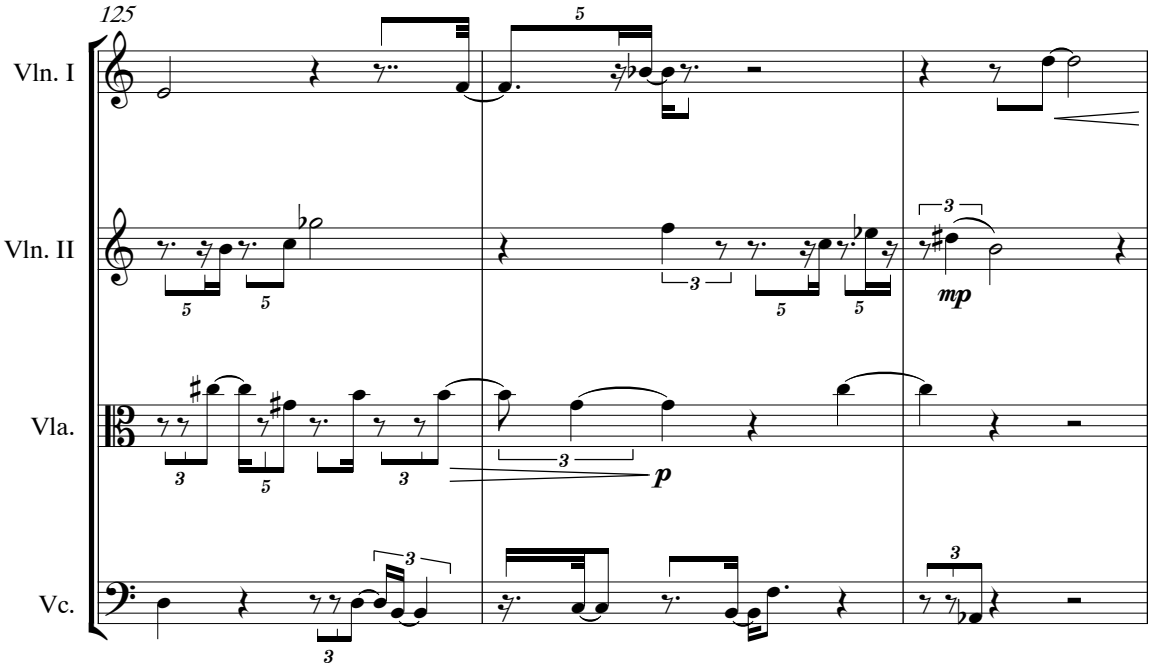

115
Vln. I
Vln. II
Vla.
Vc.
f
f
p
f
f
mp

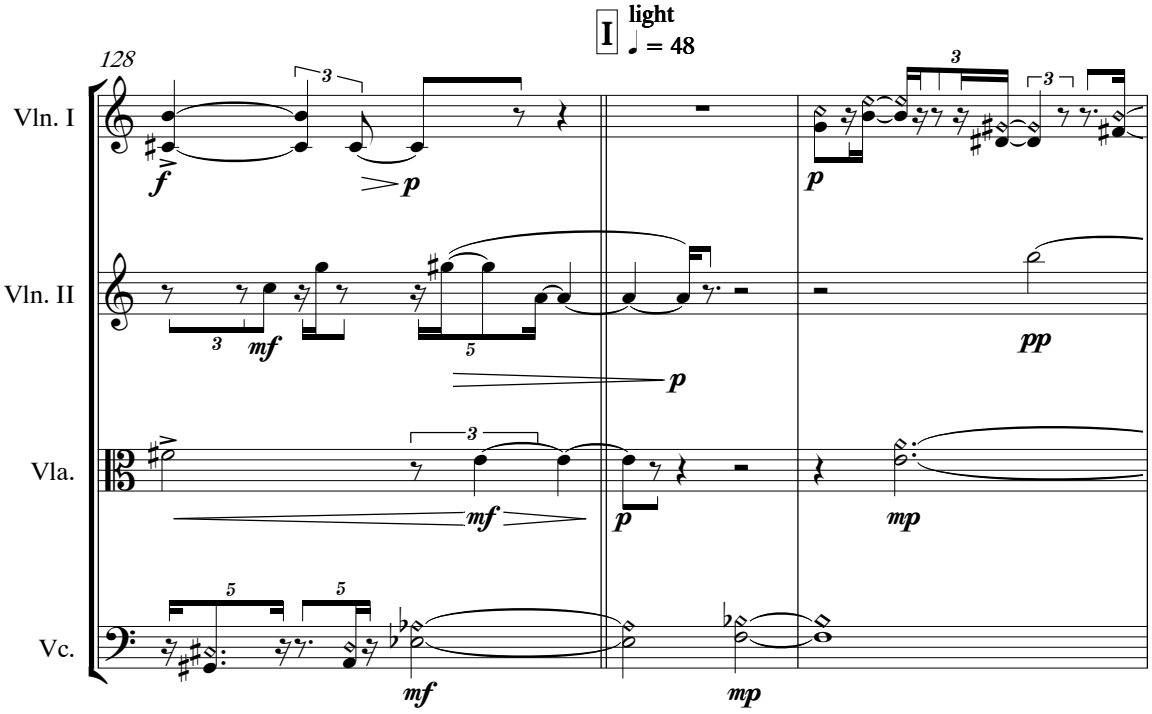

117
Vln. I
Vln. II
Vla.
Vc.
p
mp
mf
f
p
mf
p

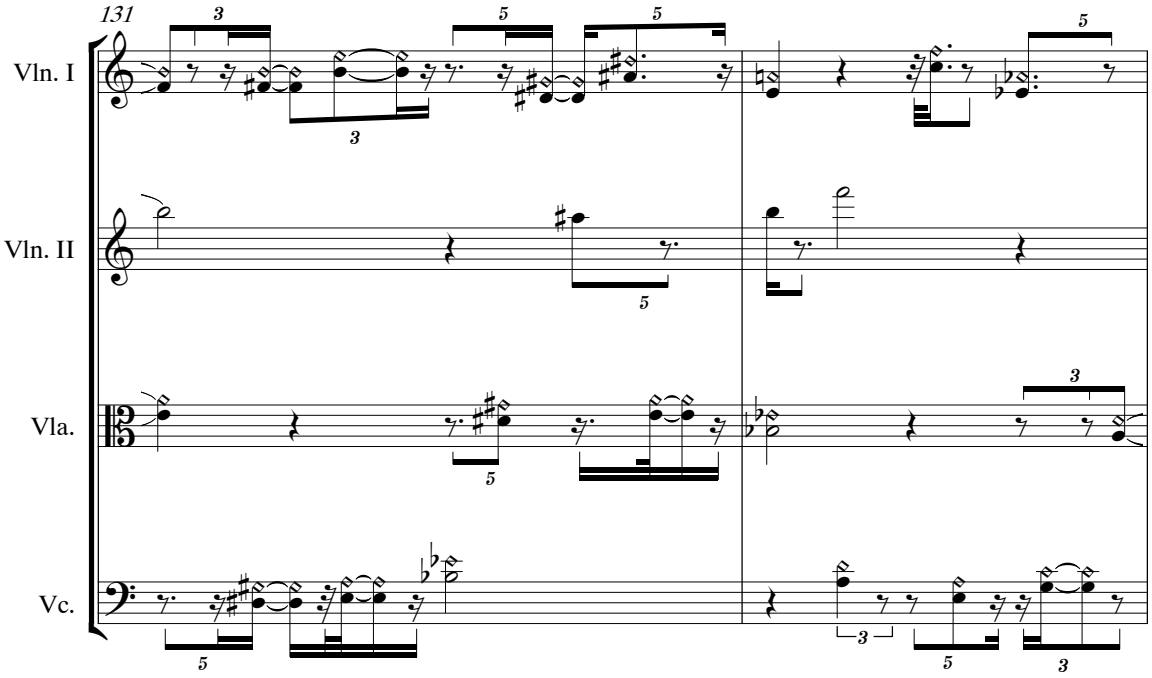

119
Vln. I
Vln. II
Vla.
Vc.
f
mf
p
pp
mp
f
mp

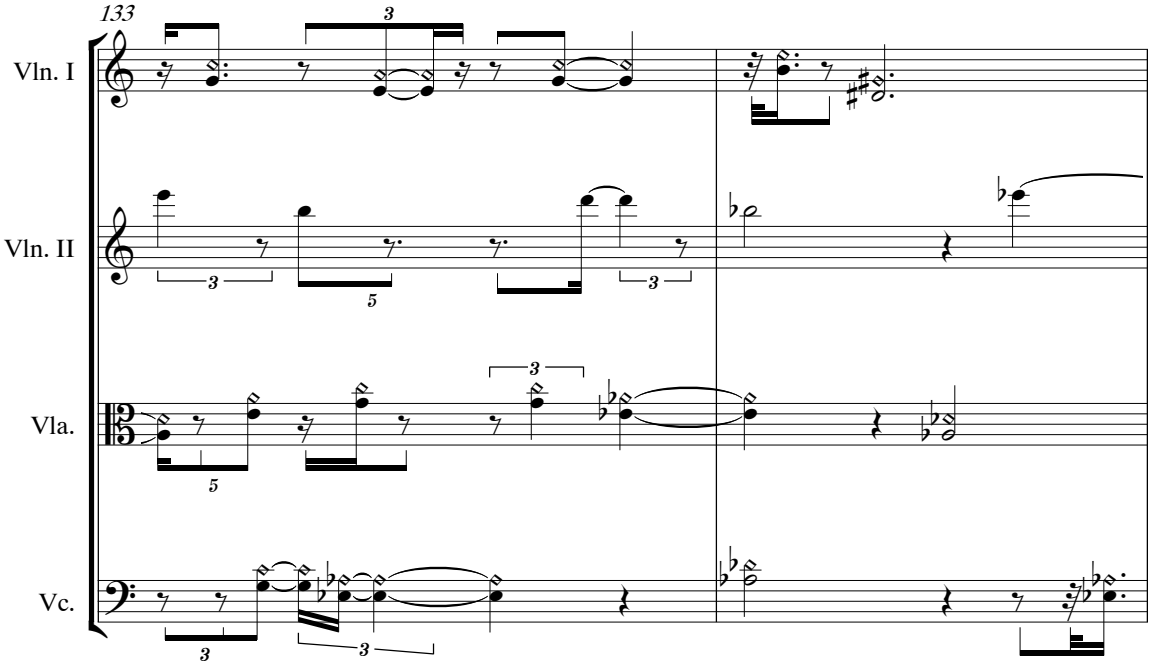

121
Vln. I
Vln. II
Vla.
Vc.
p
mp
f
f
f
p

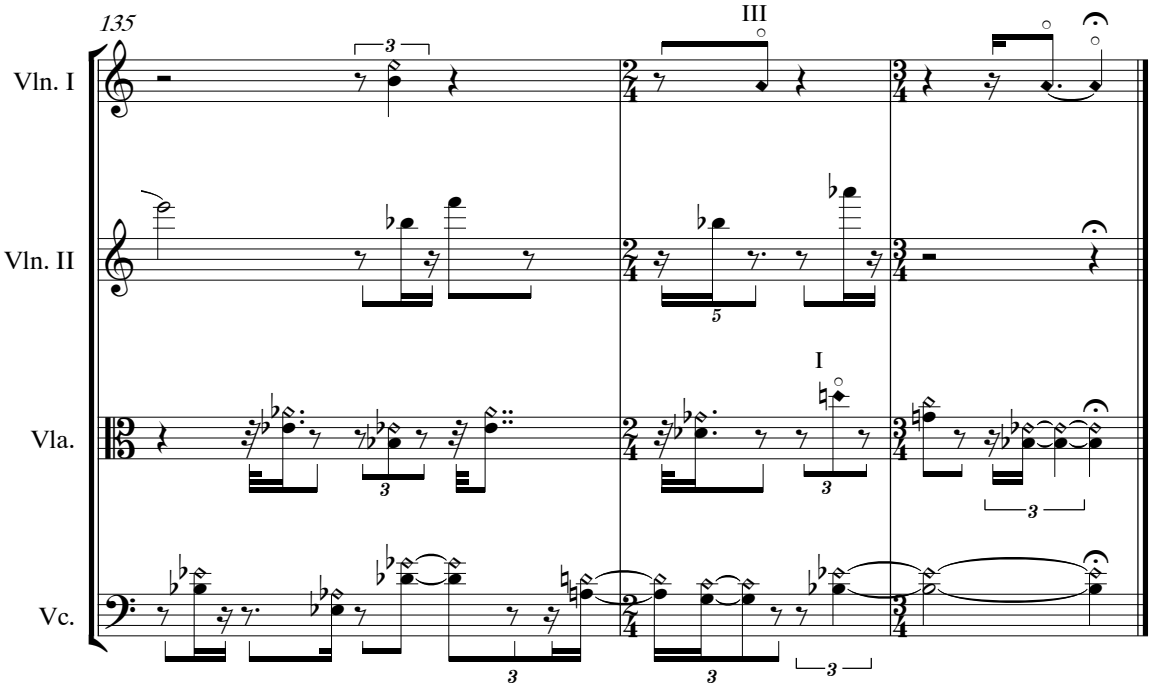

123
Vln. I
Vln. II
Vla.
Vc.
p
p
mf


125
Vln. I
Vln. II
Vla.
Vc.
mp
p


I
light
♩ = 48
128
Vln. I
Vln. II
Vla.
Vc.
f
p
mf
pp
mp


131
Vln. I
Vln. II
Vla.
Vc.


133
Vln. I
Vln. II
Vla.
Vc.


135
III
Vln. I
Vln. II
I
Vla.
Vc.

APPENDIX

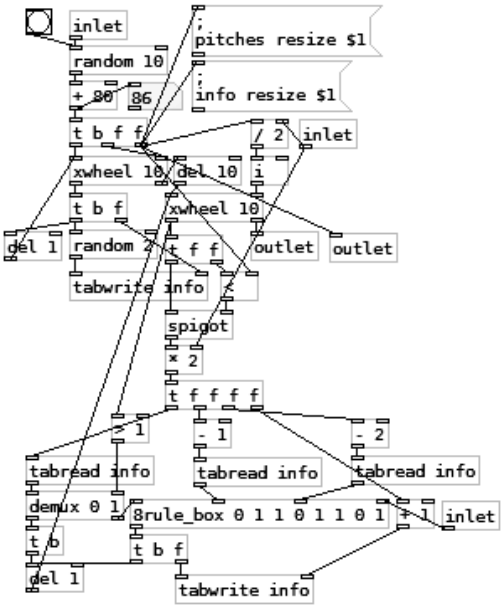


Figure A1. CA used in the generation of rhythmic material for first movement.

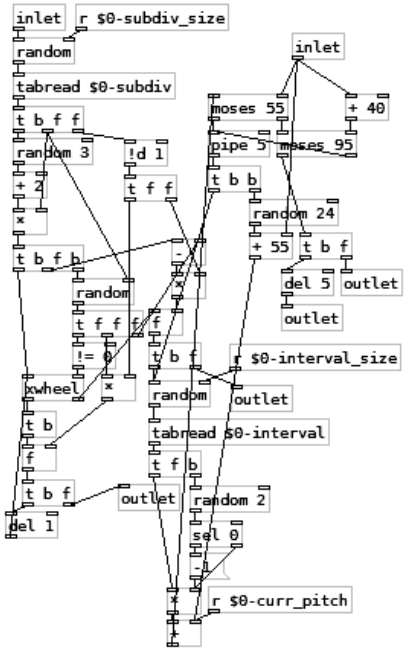


Figure A2. Patch used in the generation of long note material for first movement.

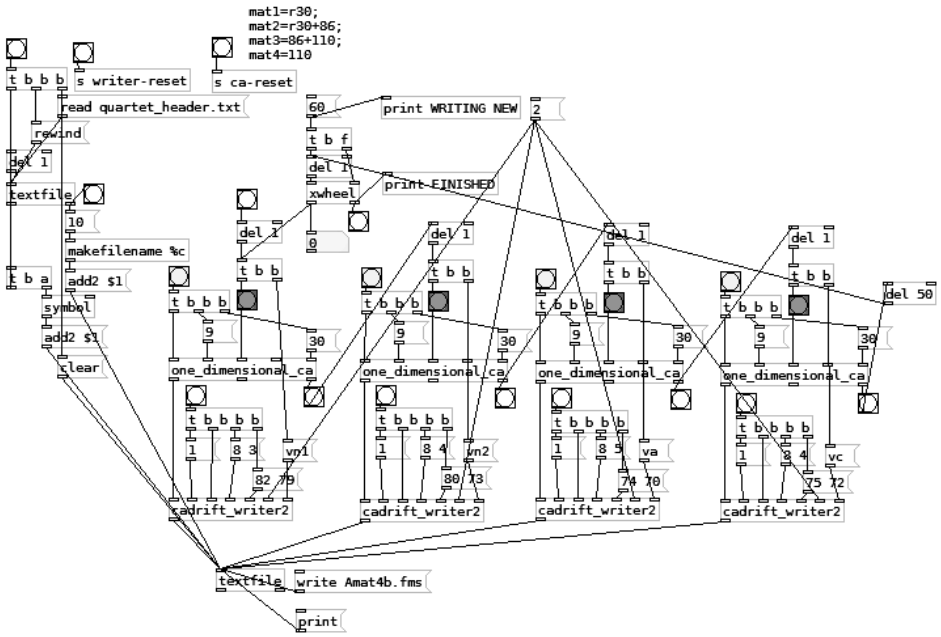


Figure A3. Patch used in the generation of material for second movement.

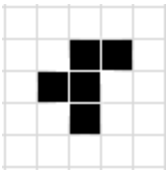


Figure A4. The r-pentomino.

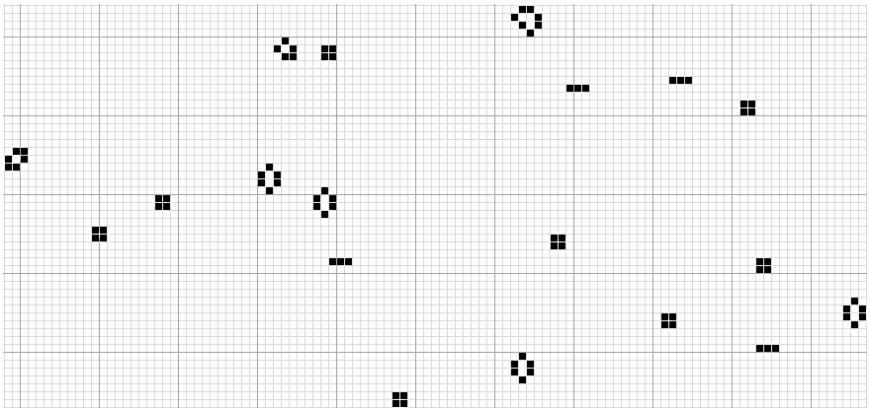


Figure A5. Generation 1,103 of the r-pentomino.

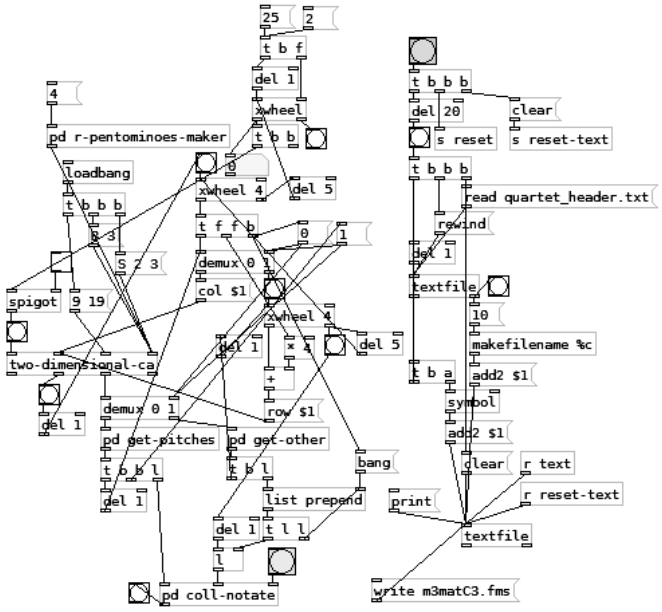


Figure A6. Patch used in the generation of material for third movement.

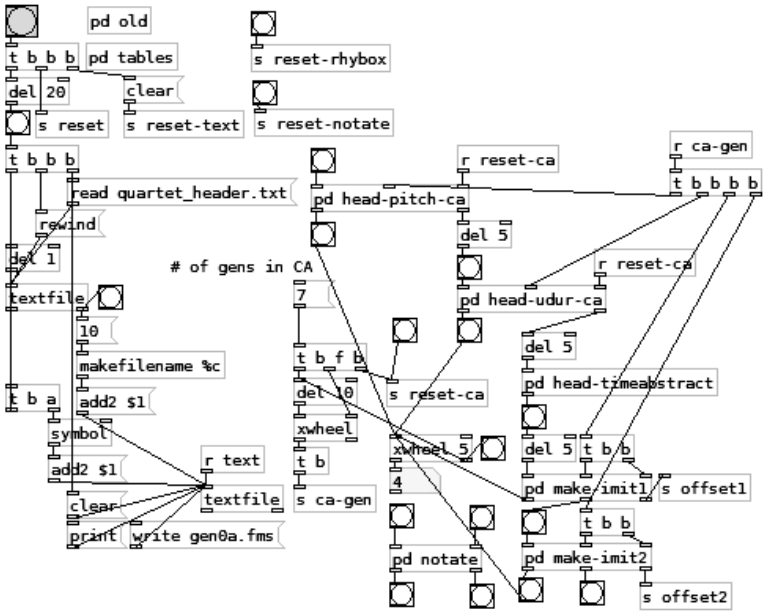


Figure A7. Patch used in the generation of material for fourth movement.