Chapter 4
Data analysis

In this chapter you will find:

1. The results of the pilot study
2. The results of the development of the eight lessons in harmonic ear training exercises (approximately 50 pages)
3. Data analysis
    - Method
    - Pretest
    - Posttest
    - Two test during treatment
    - Comparison pretest posttest

1. The results of the pilot study

Results of the Pilot Study

Student	Intervals Max 10	Quality 1 Max 10	Quality 2 Max 10	Progr 1 Max 10	Progr 2 Max 10	Progr 3 Max 10
A	5	6	8	7	8	6
B	1	7	3	9	5	6
C	3	6	2	5	1	2
D	8	7	3	10	6	8
E	1	5	3	6	4	3
F	6	8	9	10	9	6
G	5	5	3	8	7	5
H	5	6	6	8	4	6
I	7	7	10	10	7	8
J	4	6	1	8	6	6
Average	4.5	6.3	4.8	8.1	5.7	5.6
Average %	45	63	48	81	57	56

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Conclusions:

1. The results of the pilot tests confirmed the problem statement that students have problems doing harmonic ear training especially in section Progr 2 and Progr 3. Prog 2 and 3 exercises tested recognition of basic chord sequences of four chords using only diatonic chords
   F. ex. I vi V I or I IV V I
   All chord sequences start and end on the I chord.
4. Students would benefit from a higher degree of accuracy in harmonic ear training in these areas.
5. Students had difficulties with the extra question, Prog4, which tested chord sequences of four chords not starting nor ending on the I.
   Exercises using Progr 4 types (See Fig. 1) were not used in this research because of the difficulty level. (also suggested by experts.)
6. Intervals were excluded because this project concentrates on harmonic ear training and should therefore not include intervals. (suggestion by the experts)

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2. The harmonic ear training exercises

Lesson 1

Lesson 1 is divided in two sections: theory and ear training exercises.

Specific outcomes from lesson 1:

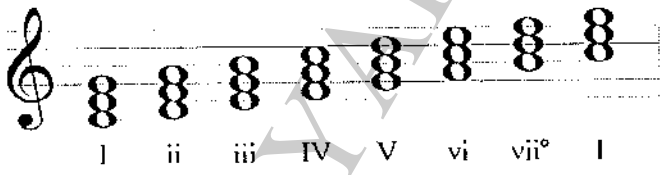
1.1. Students will have been introduced to root motion and the three types of progressions: strong, weak and superstrong.

1.2. Students will have done exercises in perceiving the aural differences between strong and weak progressions.

1.3. Students will be evaluated in recognizing strong and weak progressions by ear.

1. Introduction
   - Introduce myself
   - Agree on timetable and handout timetable
   - Explain the importance of attendance
   - Take attendance

2. Assumptions
   The teacher assumes that students know the diatonic chords and the representative Roman numeral notation, which will be used to recognize chords.
   In the key of C these are



3. Explanation of root motion (factual learning) (5min)

This part of the lesson defines the term root motion using a lecturing method.
The outcome is to have the students comprehend what is meant by 'root motion'.
Powerpoint and flash presentation are used because the visual approach is more efficient to demonstrate with an example. Although the term 'root' does not need to be explained the term 'root motion' is better not left unexplained as we will use it throughout all the lessons.

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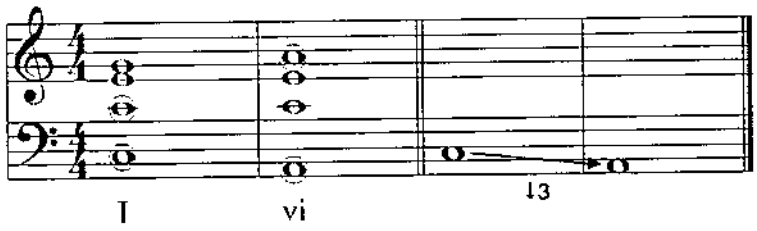
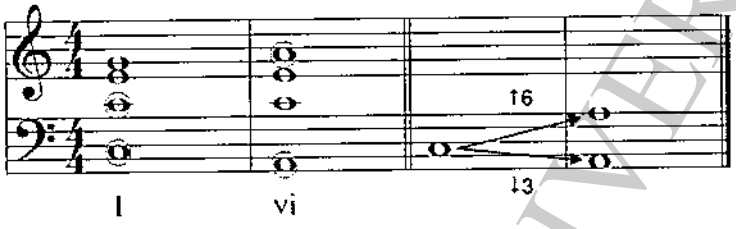


Root motion is the movement from one chord's root to another chord's root.
To demonstrate root motion, we use a I and a vi chord in C Major.
The root of the **I** chord (a C major triad) is C.
The root of the **vi** chord (an A minor triad) is A.
Therefore, the root motion between **I** and **vi** (C to A) is down a third.

Root motion



Because of interval inversion, the root motion could also be called up a sixth. Both are correct.

4. Possible root motions (factual learning) (4min)

There are only **six** root motions possible from one chord to another.
The I chord for example can only move to ii iii IV V Vi or Viio
The same is true for the other chords, for example the V chord can only move to six other diatonic chords.

Root movement by interval

I	ii	Second up
I	iii	Third up
I	IV	Fourth up
I	V	Fourth down
I	vi	Third down
I	vii	Second down

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5. The **three** types of chord progressions
   Chord progressions are categorized into **three** type:
   5.1. **Strong** (ascending)
   5.2. **Weak** (descending)
   5.3. **Superstrong**

These 3 groups have the following characteristics:

1. In terms of root motion
2. In terms of sound character

Root motion

Progression type	**ROOT MOTION (by interval)**	**Roman numeral**	**Example in the key of C**
STRONG PROGRESSION	↑4 or ↓3 (4UP OR 3 DOWN)	I to IV (4 up) I to vi (3 down) ii to V (4up) ii to viio (3 down) IV to ii (3down)	C F C Am Dm G Dm Bo F Dm
WEAK PROGRESSION	↑5 or ↑3 (5UP OR 3 UP)	I to V (5 up) I to iii (3up) ii to vi (5 up) ii to IV (3up)	C G C Em Dm Am Dm F
SUPERSTRONG PROGRESSION	↑2 or ↓2 (STEPWIZE)	I to ii V to vi iii to ii V to IV	C Dm G Am Em Dm G F

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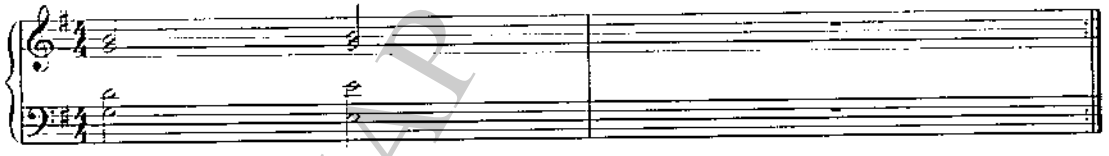
Sound character

Progression type	Sound (what we hear)
STRONG PROGRESSION	First chord moves forward towards the second chord The second chord sounds as if it was expected
WEAK PROGRESSION	First chord does not move towards the second chord The second chord sounds as unexpected or as a surprise
SUPERSTRONG PROGRESSION	Very strong forward movement in steps

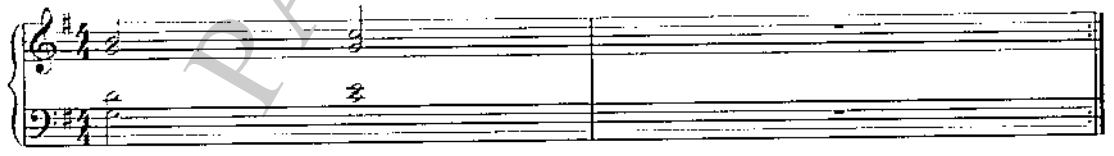
6. Listening examples.
   Teacher plays the examples from the computer.

   6.1. Strong progressions:

example strong I vi



example strong I IV



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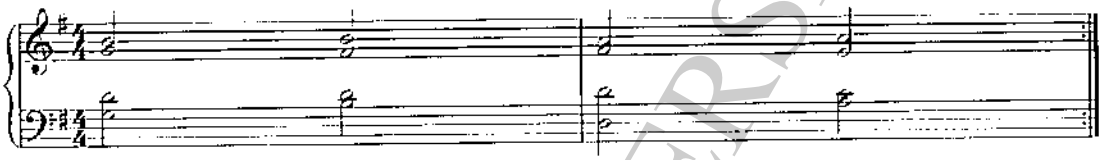
6.2. Weak progressions:

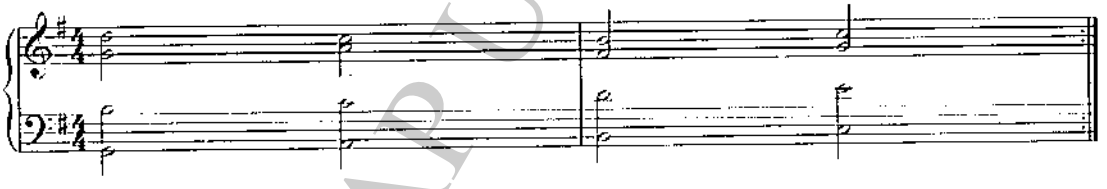
example weak I iii

example weak I iii V ii

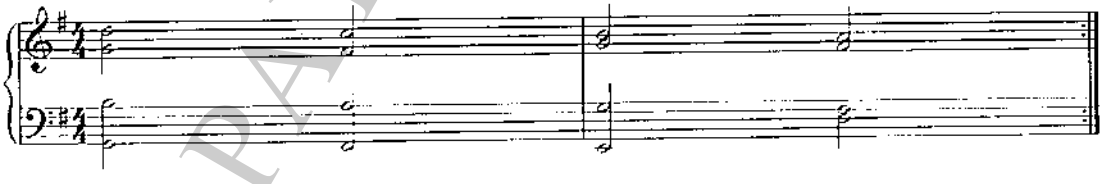


6.3. Superstrong progressions:

example superstrong I ii iii IV



example superstrong I viio vi V



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7. Exercises

Objective: the purpose of the following exercise is to distinguish **strong** from **weak** progressions by ear.
In this way the students are forced to listen in a horizontal way, students listens the how one chord moves to the other. Students do not have to name the chords.

Activity: Listen carefully to the following examples. Students do not try to name the chords only recognize if the progression sounds strong or weak. Listen to the whole rather than to the separate parts.
Students do not have the music to follow with, only ears are used.

Question: What type of progression is used, choose between strong or weak.

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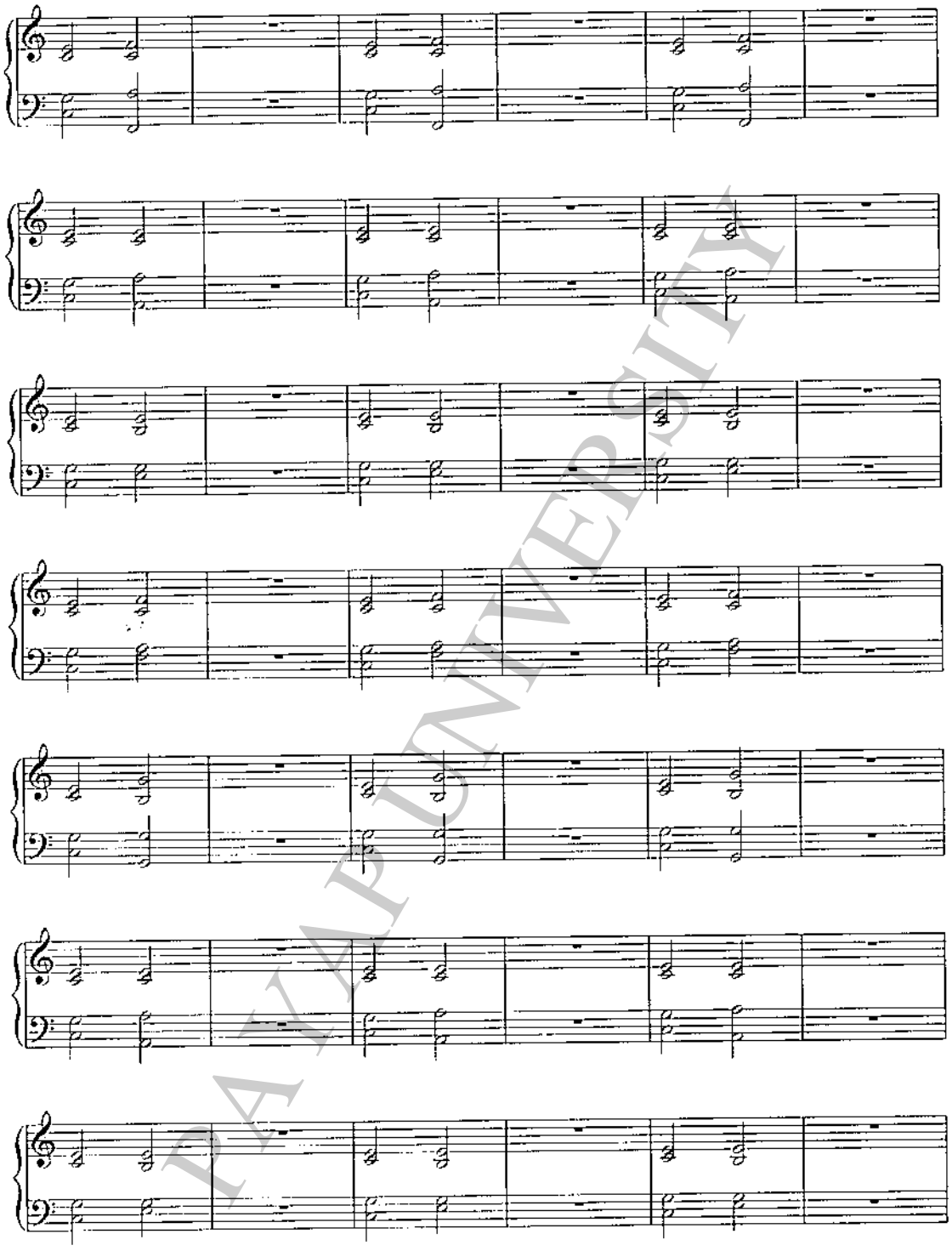
Ex A1



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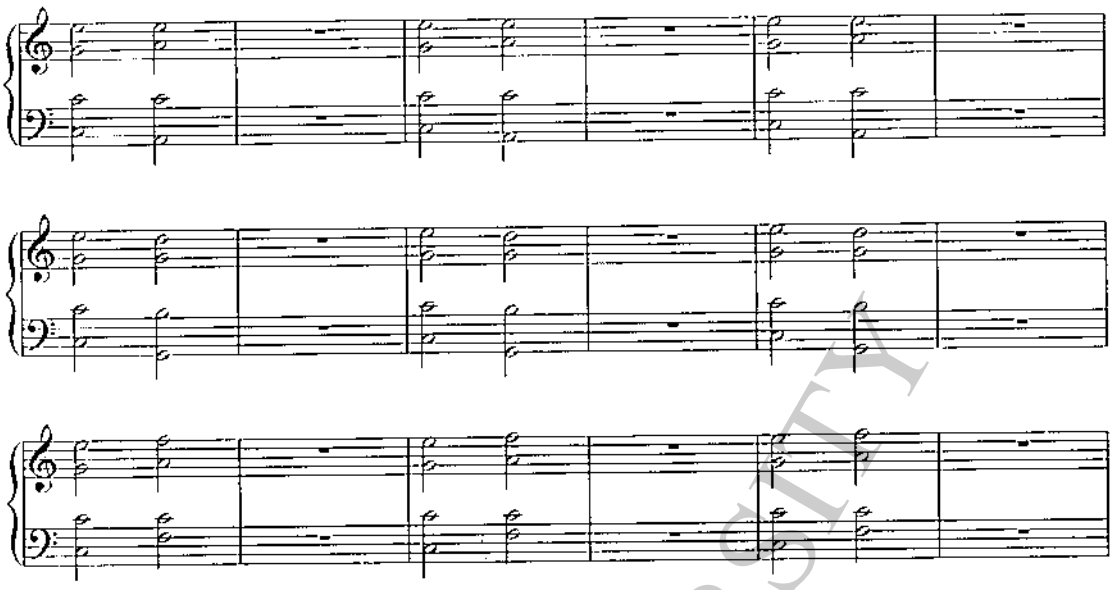

Conclusions:

1. The three progressions are strong, weak and superstrong.
2. We can recognize them by sound or by root motion.

For example:

IF a chord moves strongly towards the second chord then we have a **strong progression.** The second chord sounds as expected and temporarily resolved.

Or

IF a chord moves away from the first chord then we have a **weak progression.** The second chord sounds as a surprise or sounds unresolved.

Or

IF a chord moves down by a third to the second chord then we have a **strong progression.**

or

IF a chord moves up by a third to the second chord then we have a **weak progression.**

Type	Sound	Interval (root motion)
STRONG	moves towards the next chord	↑4 or ↓3
WEAK	Does not move towards the next chord	↑5 or ↑3
SUPERSTRONG	Moves forwards in steps (seconds)	↑2 or ↓2

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Lesson 2

Specific outcomes

1. Students will have done ear training and been evaluated in aural recognition of chord type progressions
2. Students will have done ear training and been evaluated in aural recognition of chord qualities: minor major
3. Students will have done ear training and been evaluated in aural recognition of chord progressions

Structure

Lesson 2 is divided into two sections: review of the root motion concept and ear training exercises.

The recognition of chord progressions needs to be subdivided into subskills. A skill can often be broken down into still smaller units. It is in learning these "subskills" that a drill approach seems to fit best. (Merrill and Salisbury, 1984) It is time sufficient method.

The reason is that students who have problems recognizing single chords will also have problems with chord progressions. Therefore the exercises are divided into three sections:60

- identification of chord progression types
- chord quality identification
- chord progression identification

1. Introduction: Check attendance

2. Short review of the root motion concept.

In the first lesson we learned about root motion and the three types of progressions: strong, weak and superstrong progressions.

Each type has the following characteristics:

Type	Sound	Interval (root motion)
STRONG	moves towards the next chord	↑4 or ↓3
WEAK	Does not move towards the next chord	↑5 or ↑3
SUPERSTRONG	Moves forwards in steps (seconds)	↑2 or ↓2

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3. Exercises:

This part of the lesson is divided into three sections: chord progression type recognition, chord quality recognition and chord progression recognition.

Process: The teacher plays the items of the exercises using the Sibelius music software after which the student immediately answers on the answering sheets provided. Each item is repeated according to the conditions stated at the beginning of each exercise.

Evaluation: All exercises are evaluated. Each item of an exercise counts as one point.

3.1. Chord progression types

Conditions :

Items	Repeats	Delay	Chords per progression	Change of key	Types
10	2	4	2	No	Strong and weak

(Process: The teacher plays the chords using the Sibelius music software after which the student answers on the answering sheets. Each item is repeated two times with 4 seconds pause in between repeats.)

Evaluation is done using answering sheets. Each item of an exercise counts as one point, totaling 10 points.)

Question: Identify the type of progression played. Answer with strong or weak.

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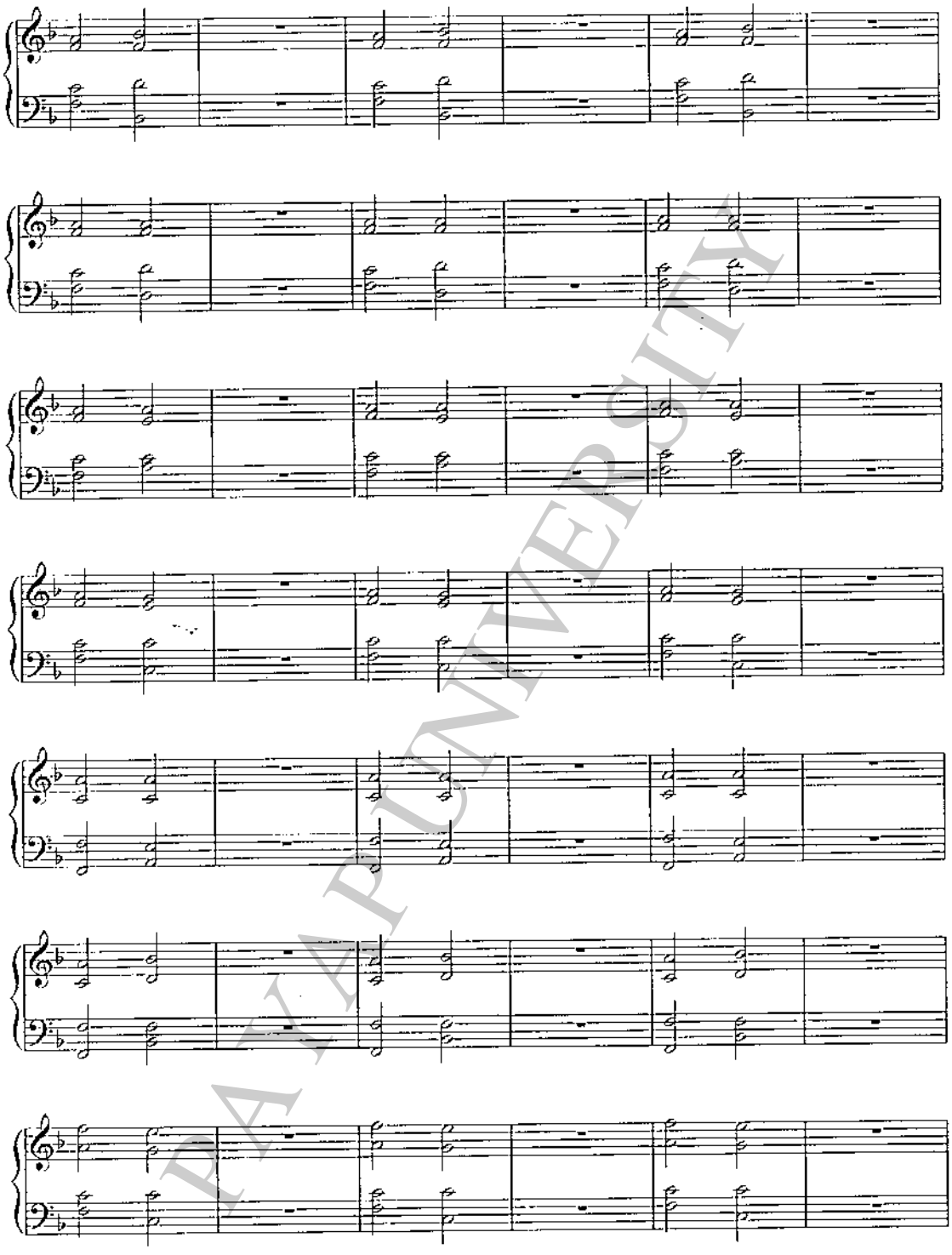
Ex A2



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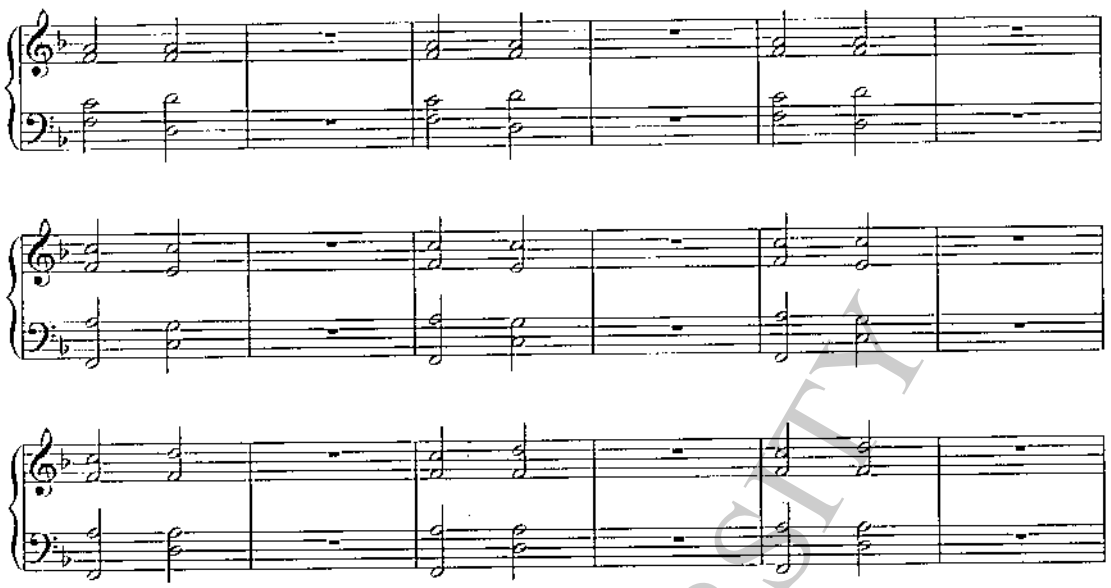

3.2. Chord qualities:

Conditions

Items	Repeats	Delay	Level	Key Change	Contents
20	2	3	1	YES	Maj - Min

(Process: The teacher plays the chords using the Sibelius music software after which the student answers on the answering sheets. Each item is repeated three times with 3 seconds pause in between repeats.

Evaluation is done using answering sheets. Each item of an exercise counts as one point, totaling 20 points.)

Question: Identify the quality of each chord played, no inversion are used. Answer with major and minor.

EX B2

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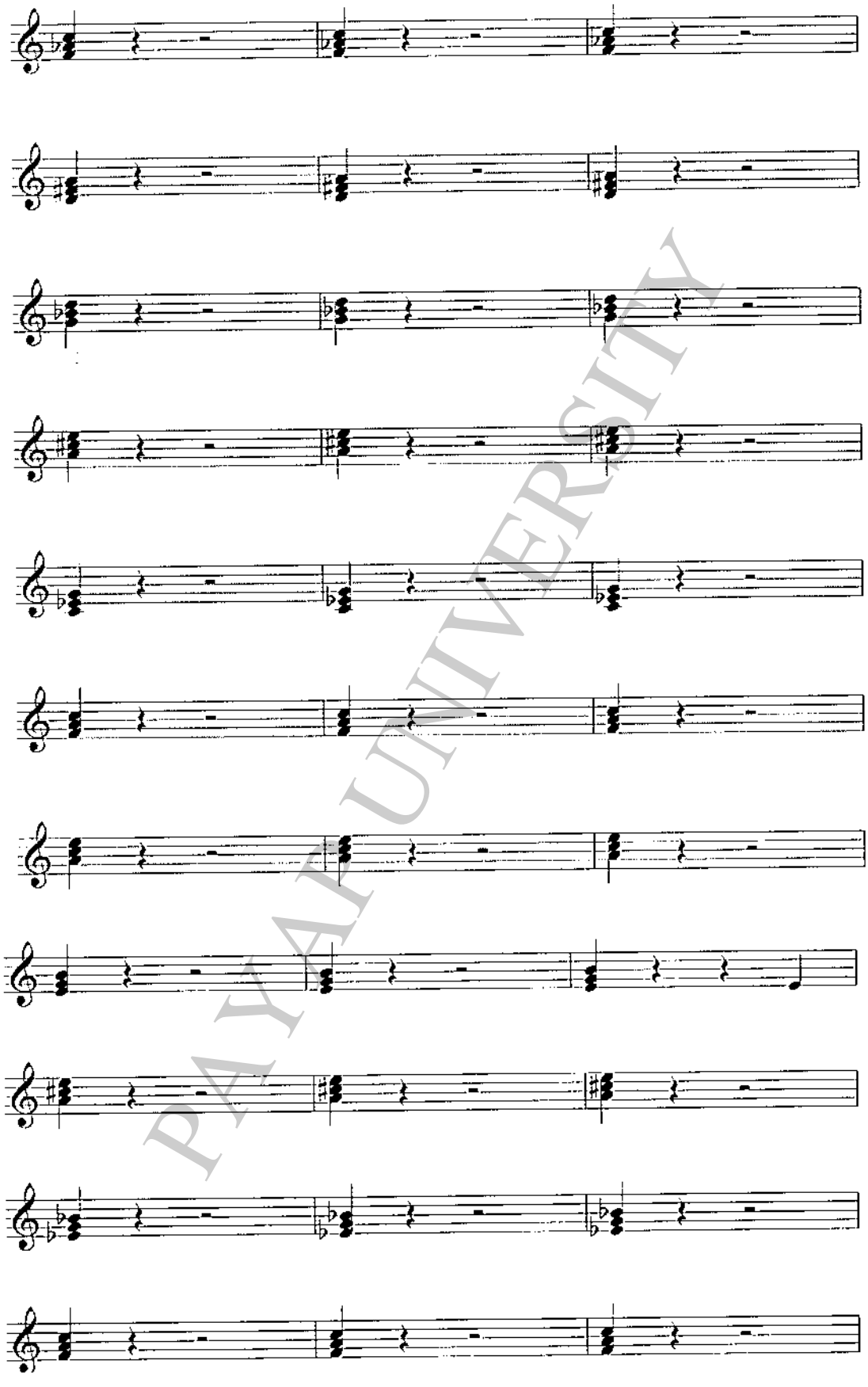

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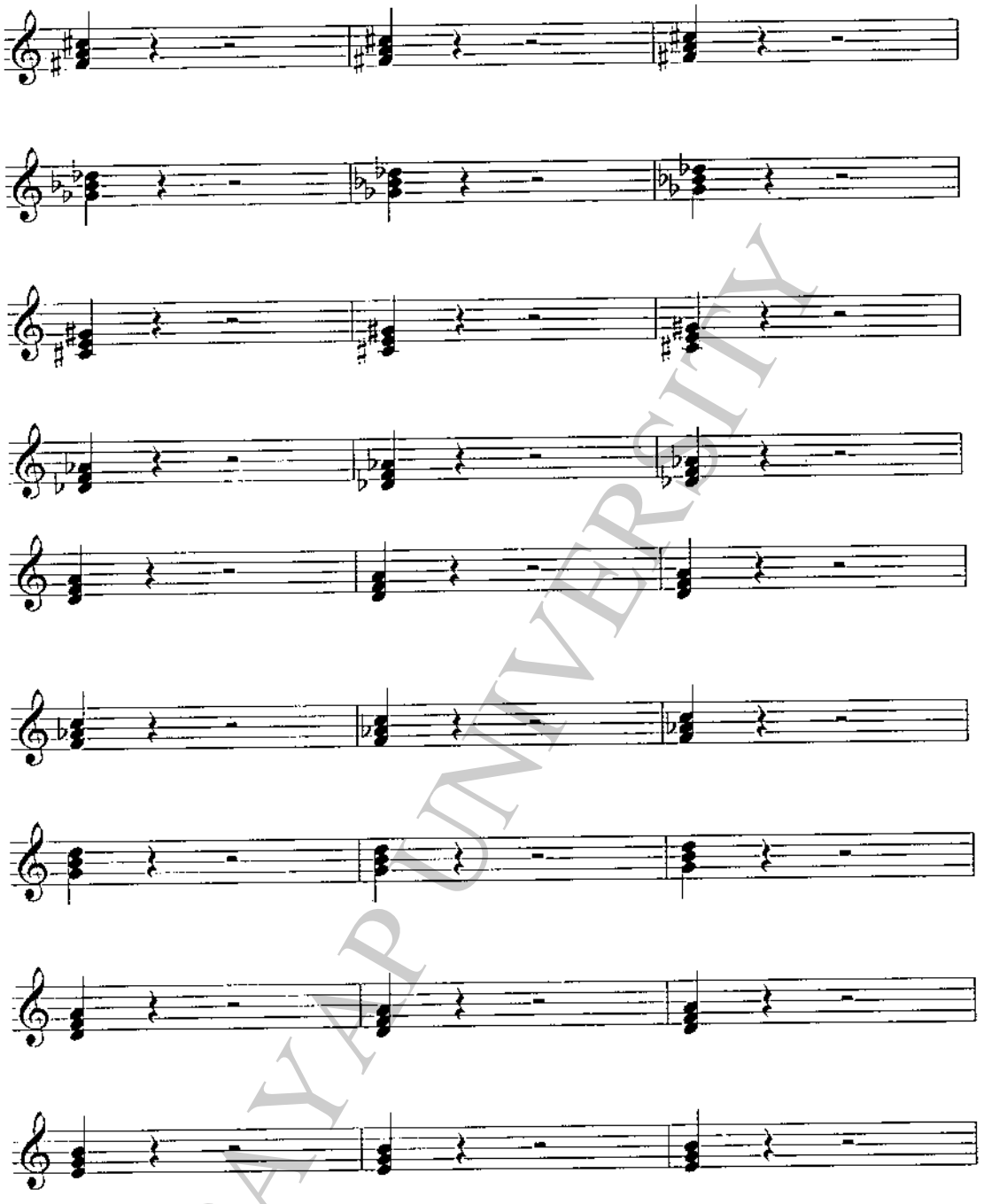

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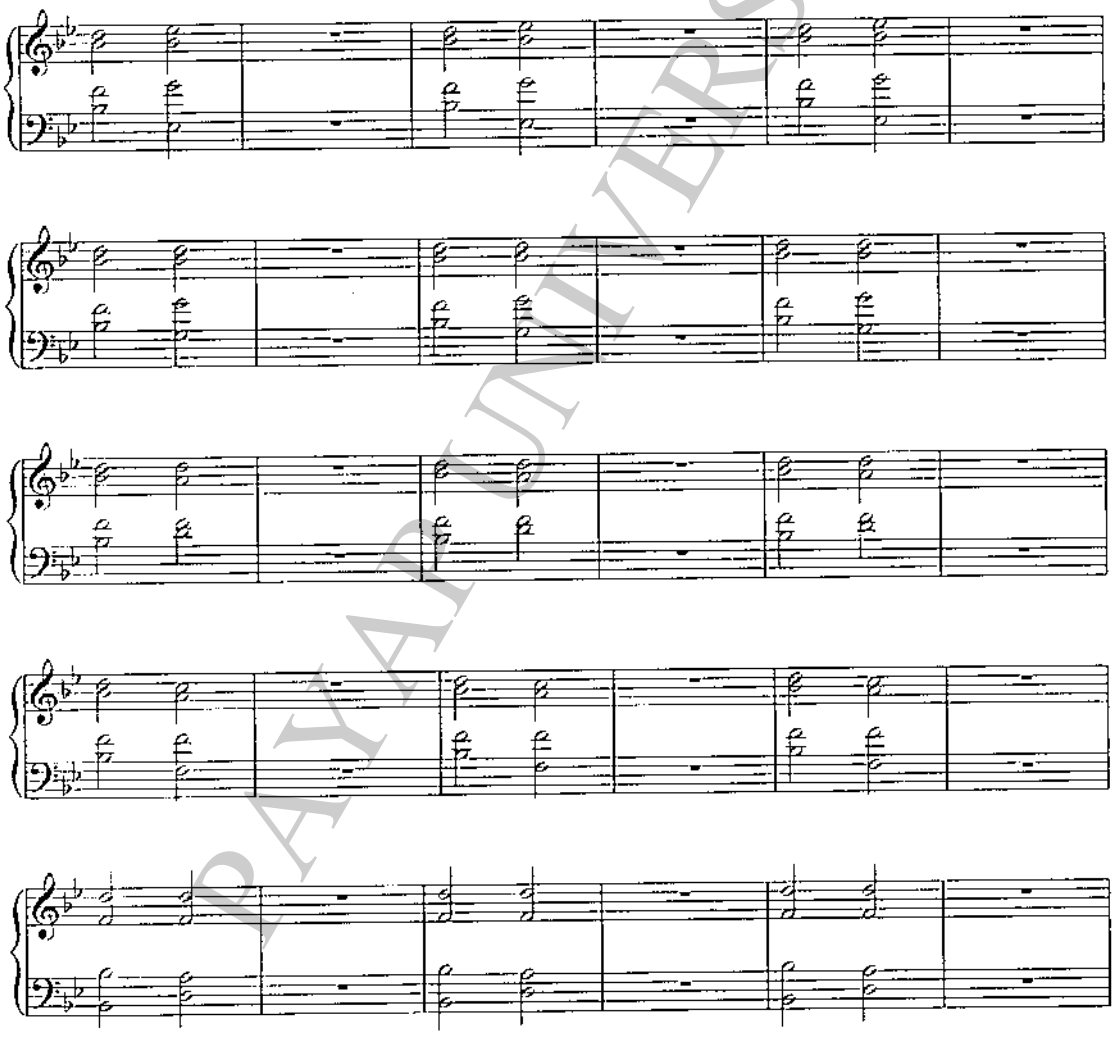
3.3. Chord progressions

Conditions:

Contents	Repeats	Delay	Chords per progression	Change of key	First chord
20	2	4	2	No	I

Ex C2



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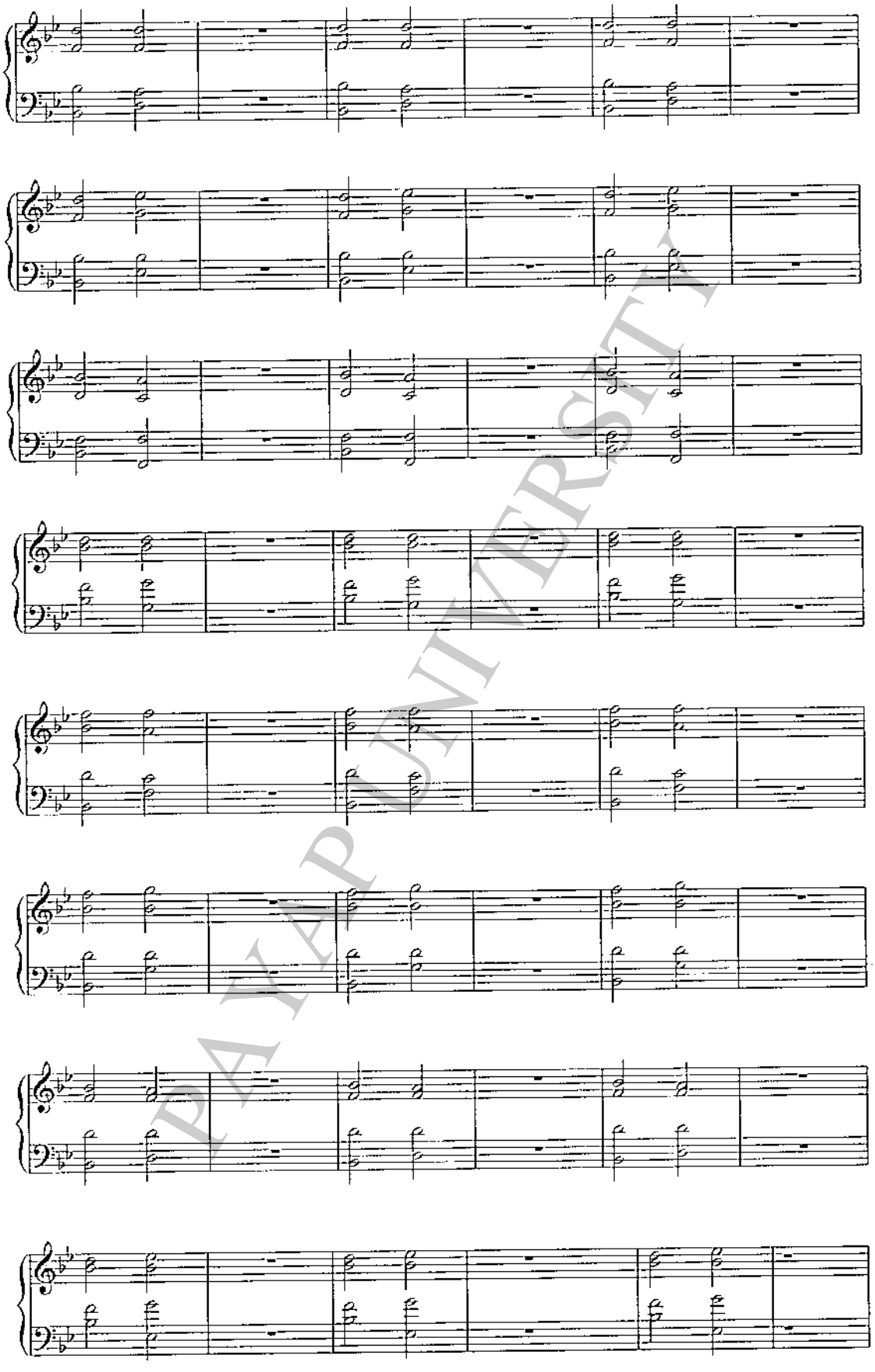

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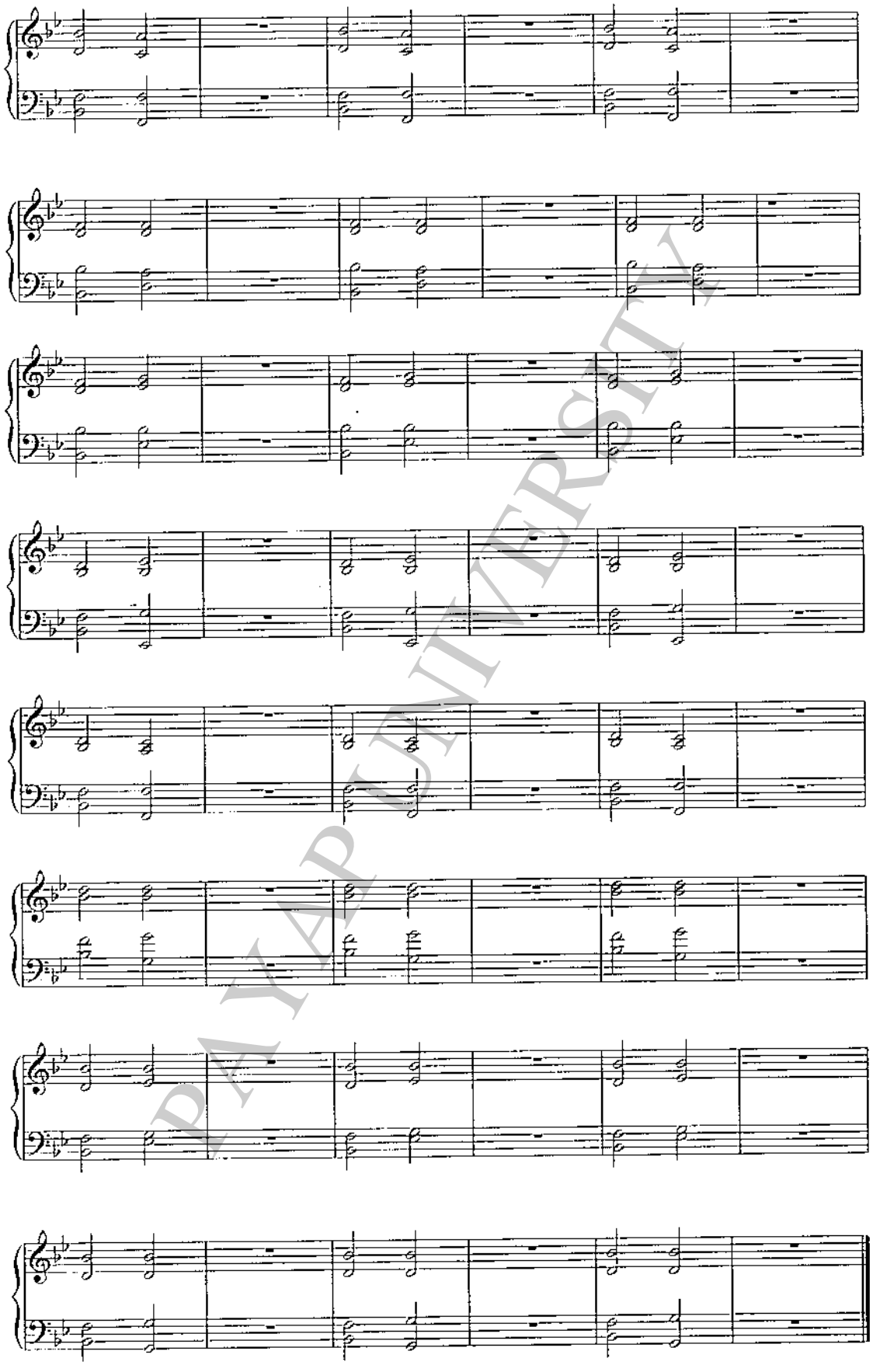

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Lesson 3

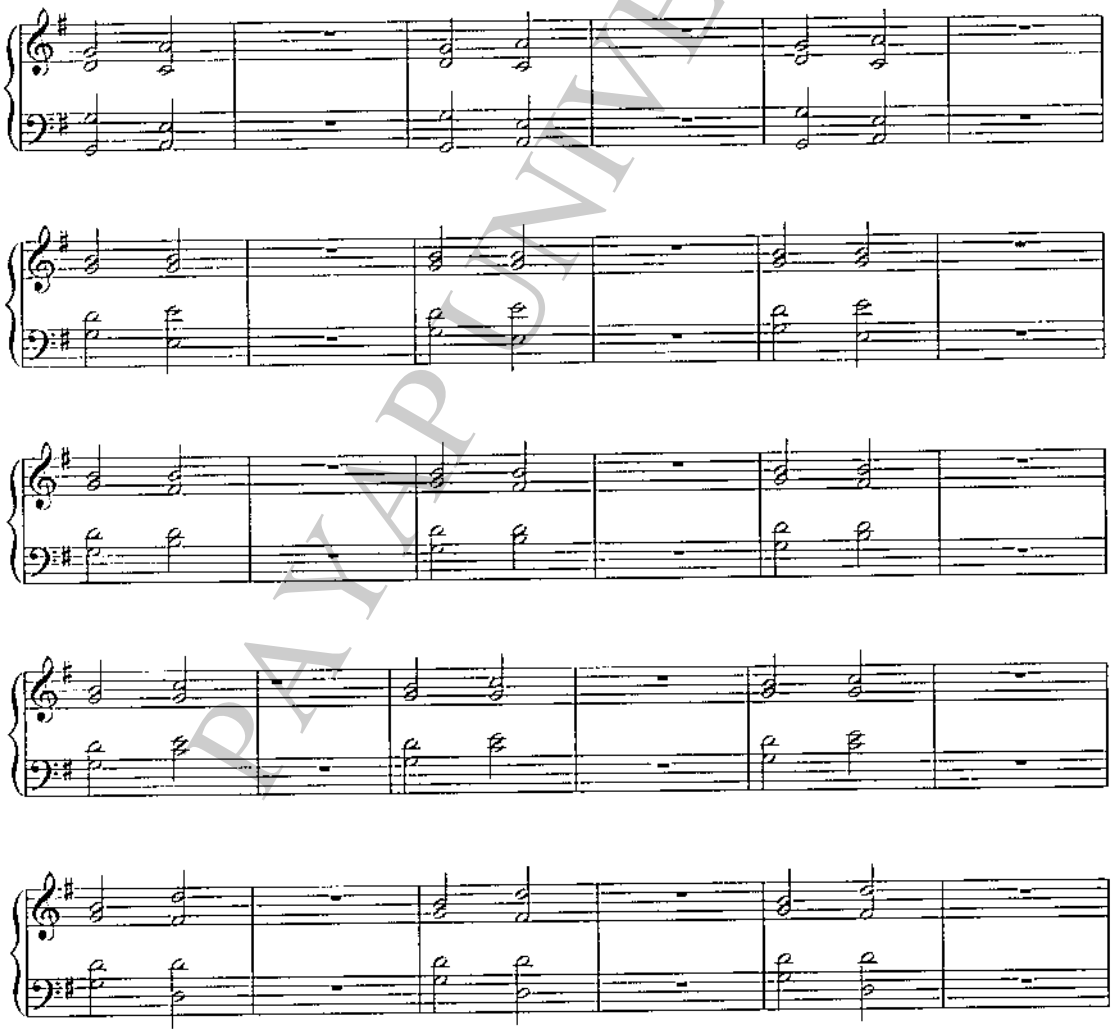
Exercises

1. Chord progression type.

Conditions:

Items	Repeats	Delay	Chords per progression	Key change	Types
10	2	4	2	No	Strong, weak, superstrong

Ex A3



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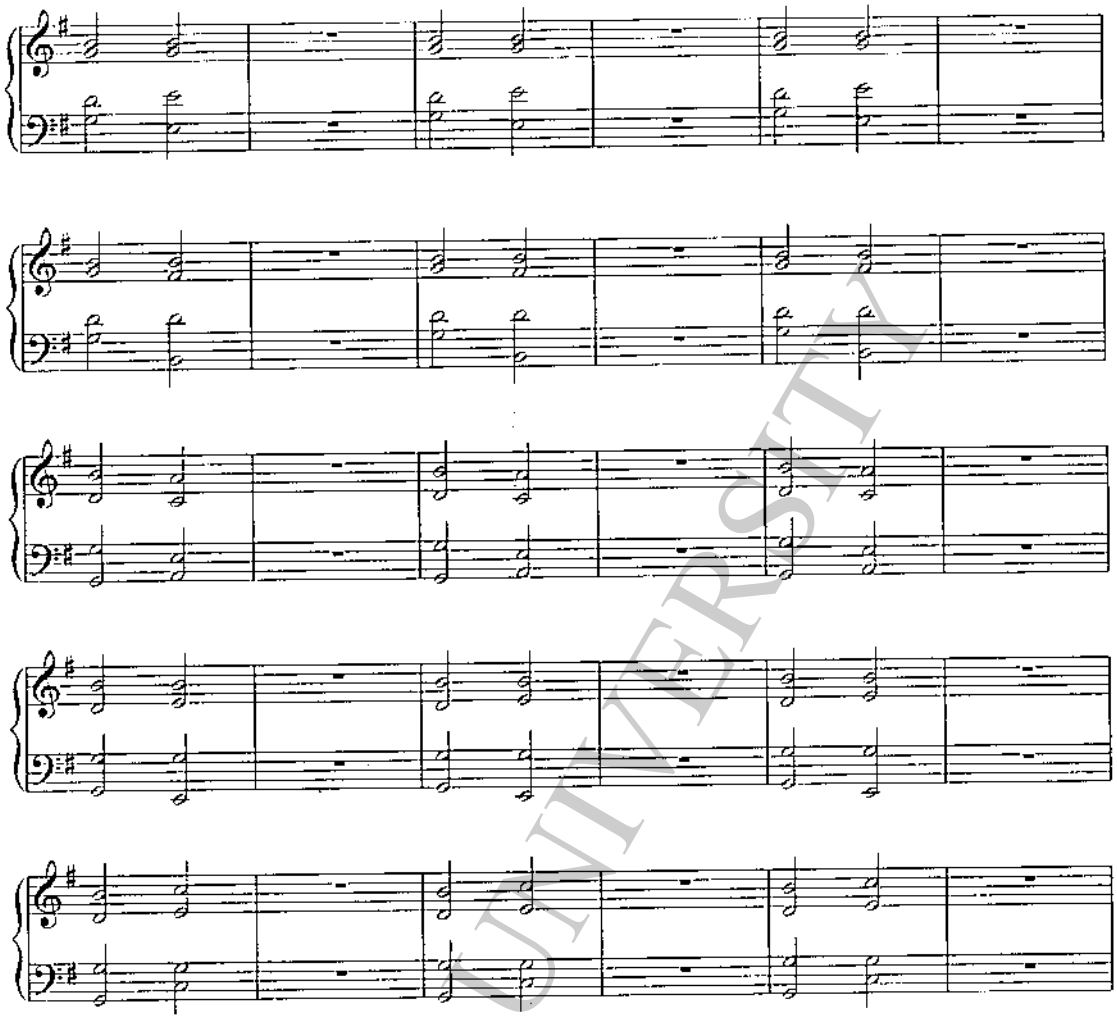

2. Chord quality.

Conditions:

Items	Repeats	Delay	Level	Key change	Contents
20 exercises	2	3	1	YES	Major - Minor

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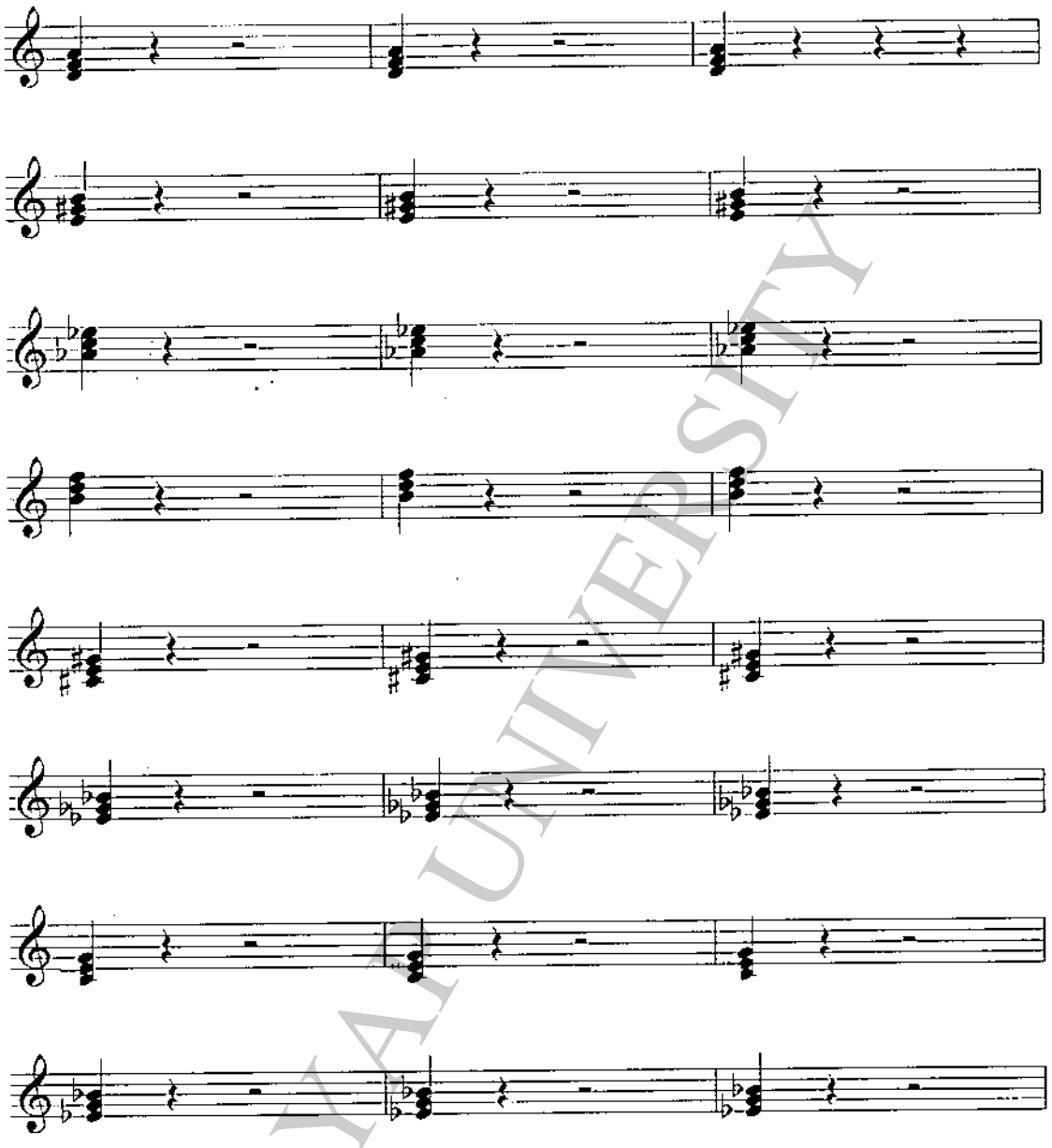
Ex B3



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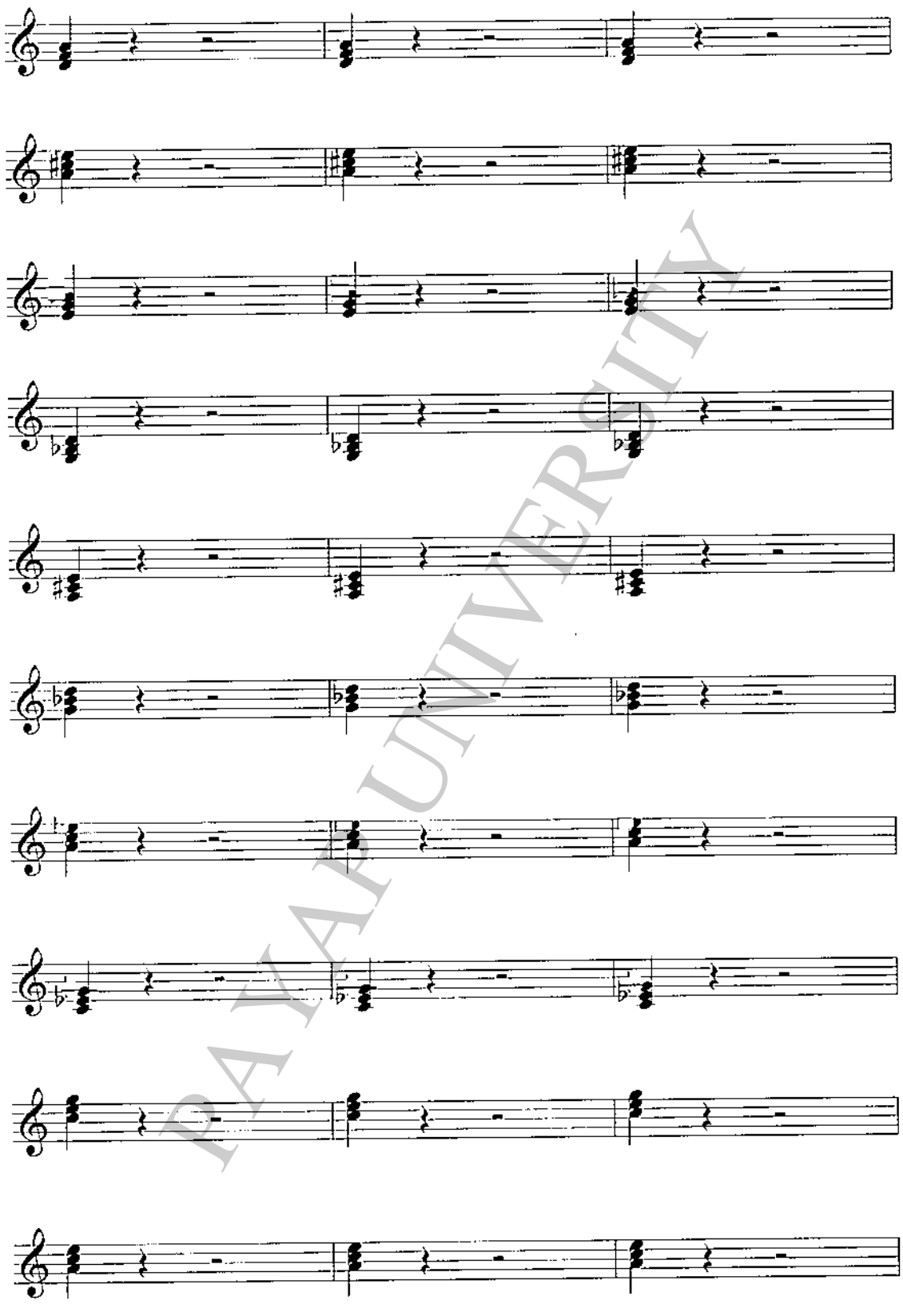

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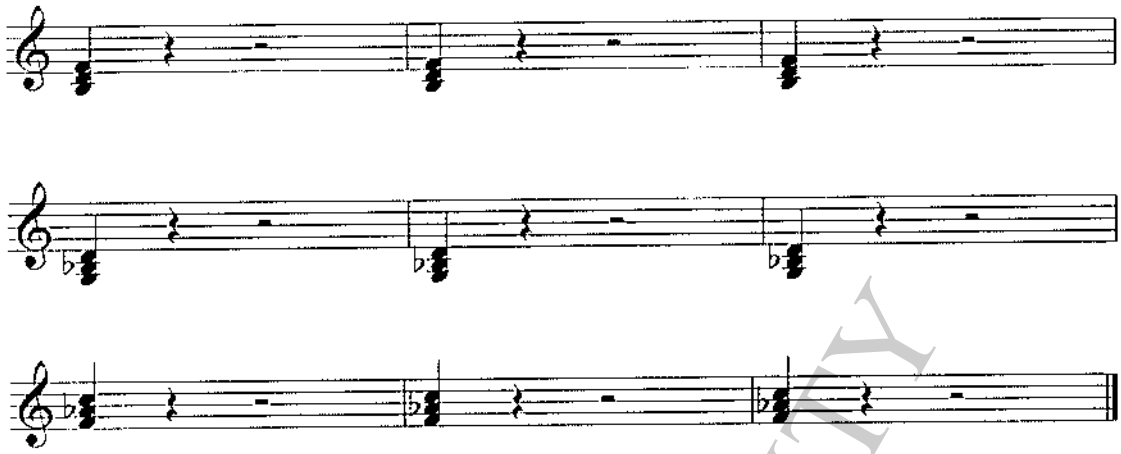
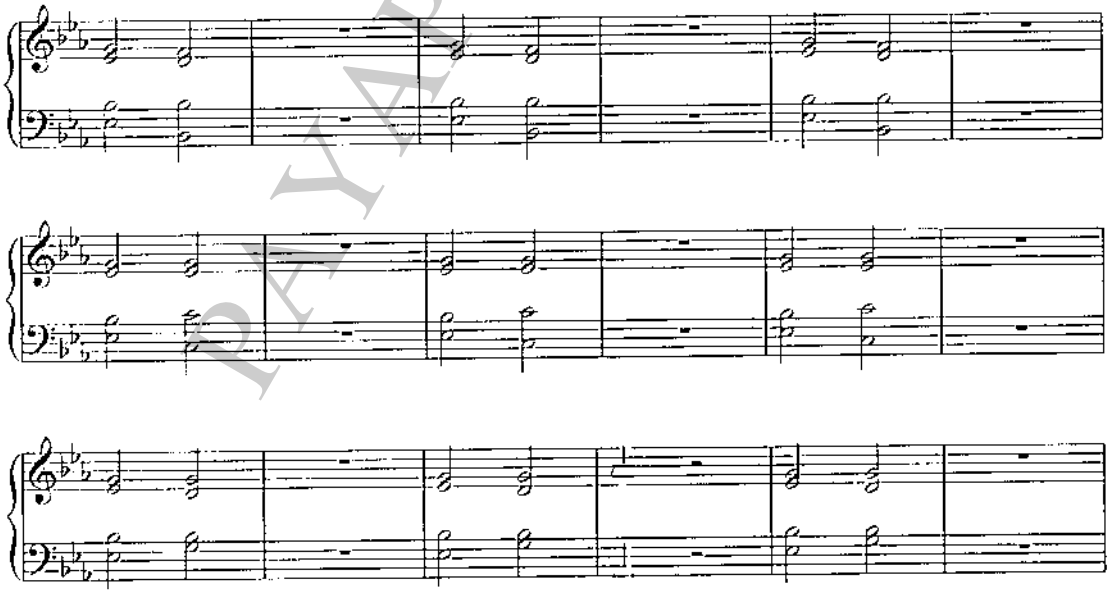


3. Chord progressions:

Conditions:

Items	Repeats	Delay	Chords per progression	Change of key	First chord
20	2	4	2	No	I

ExC3



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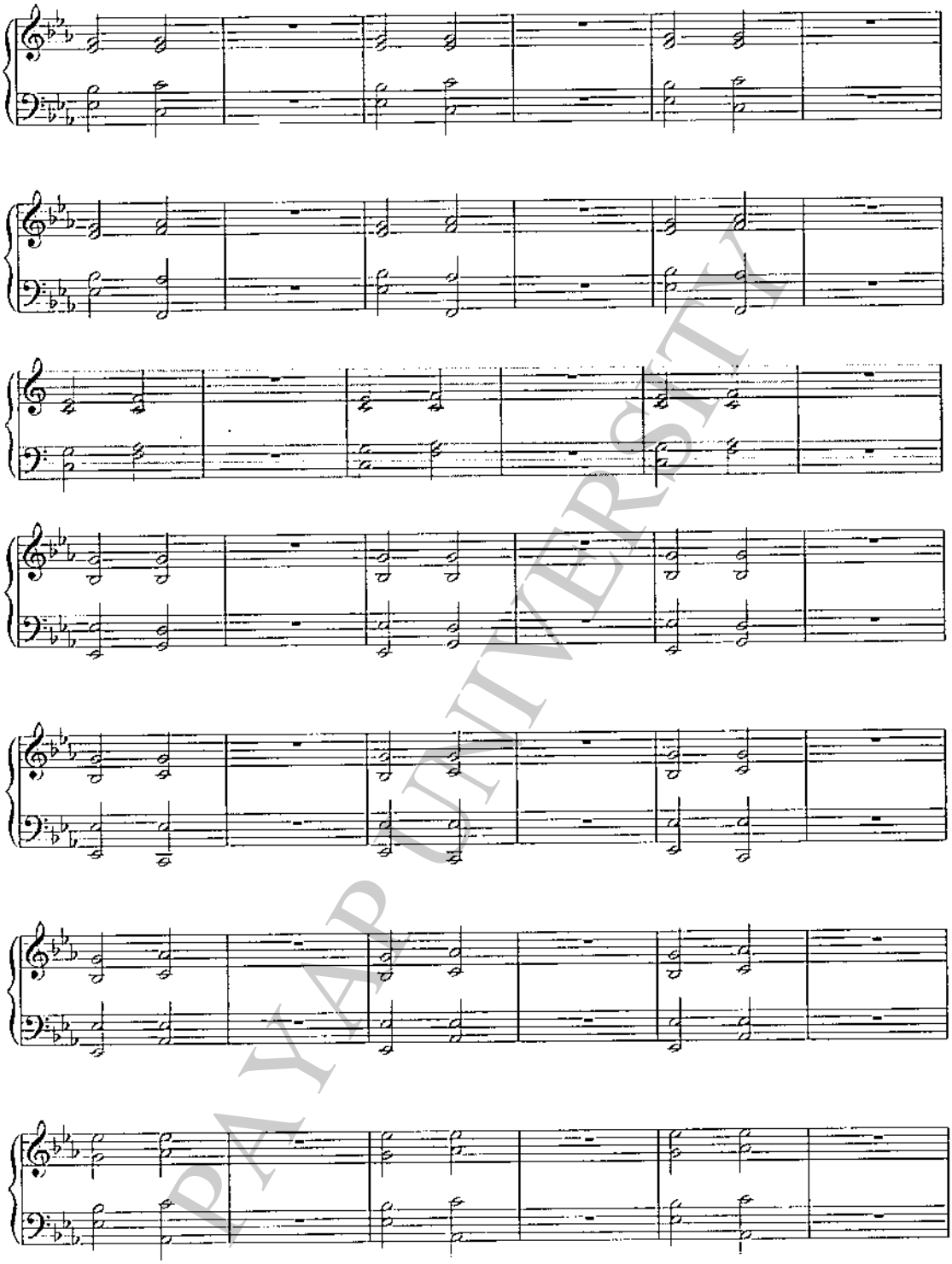

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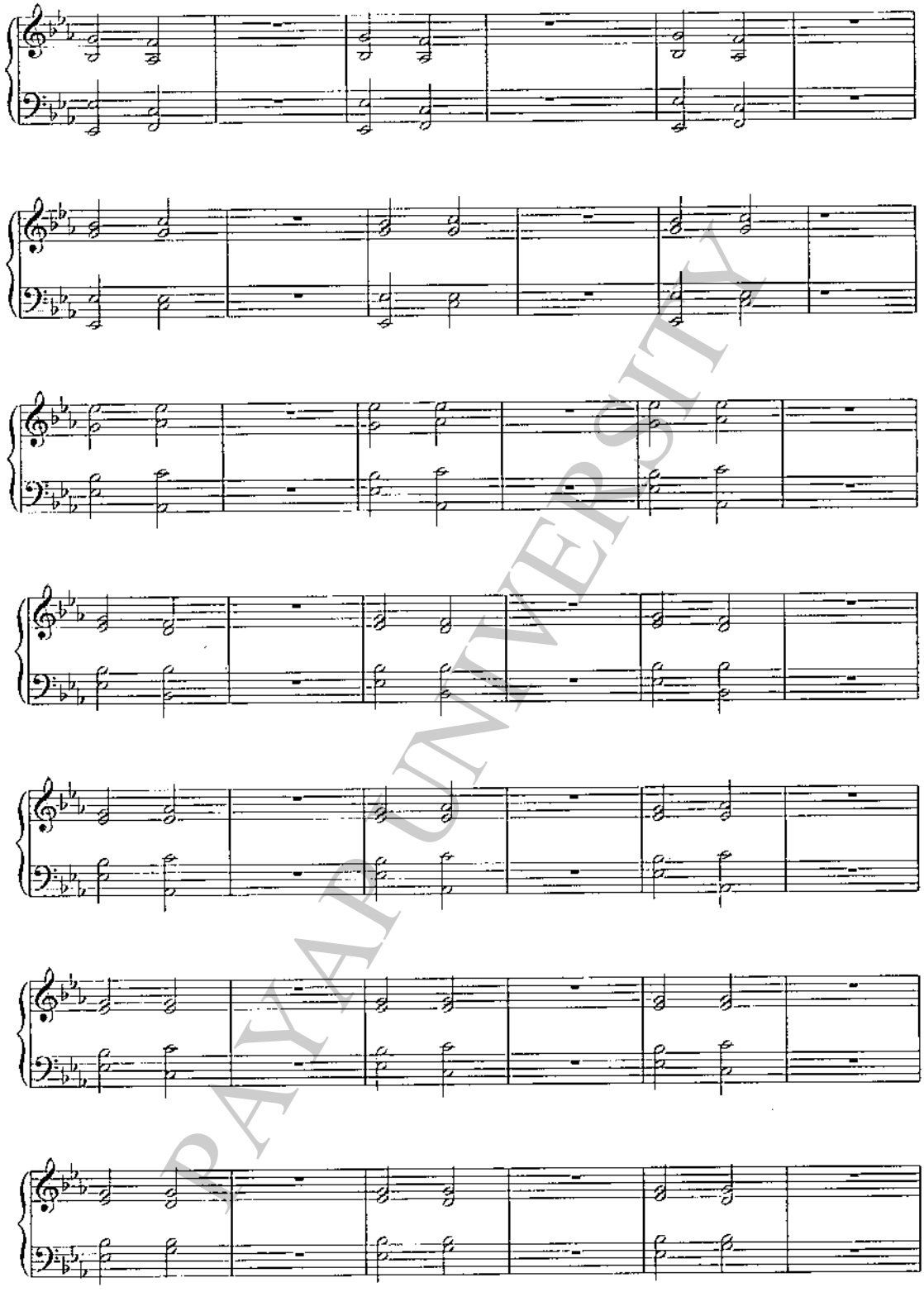

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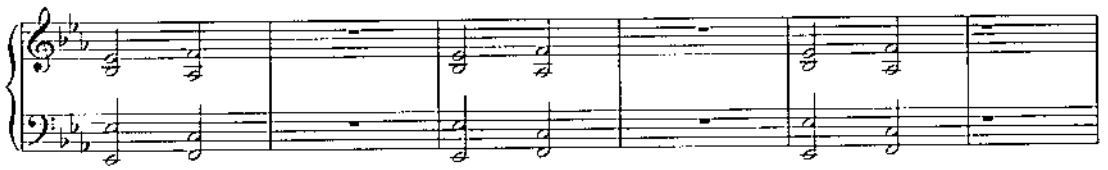
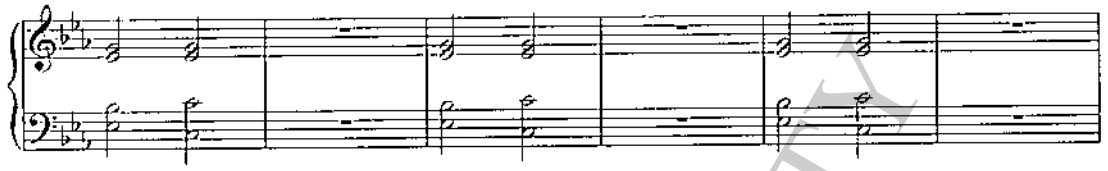




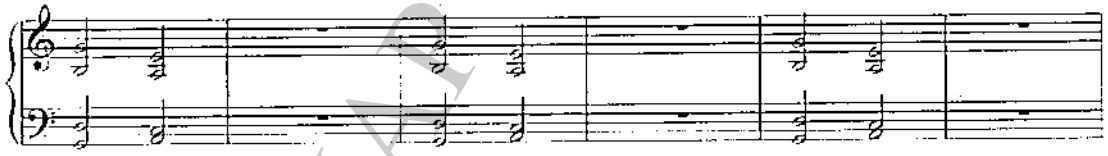
Lesson 4

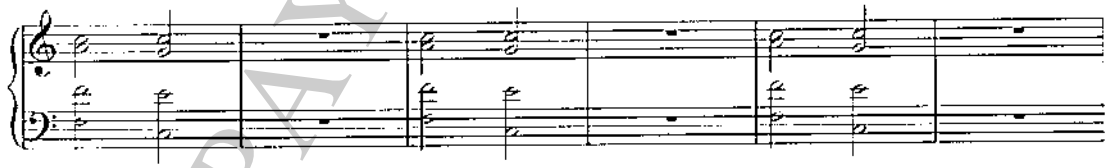
1. Chord progression type.

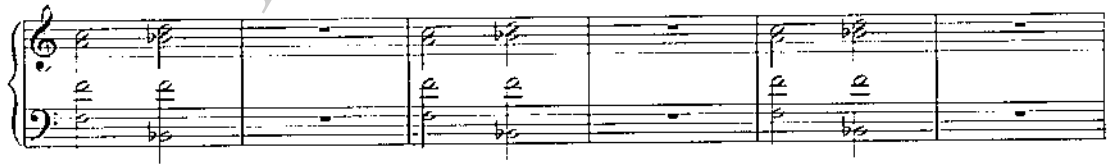
Conditions:

Contents	Repeats	Delay	Chords per progression	Change of key	First chord
10	2	3	2	YES	I

ExA4







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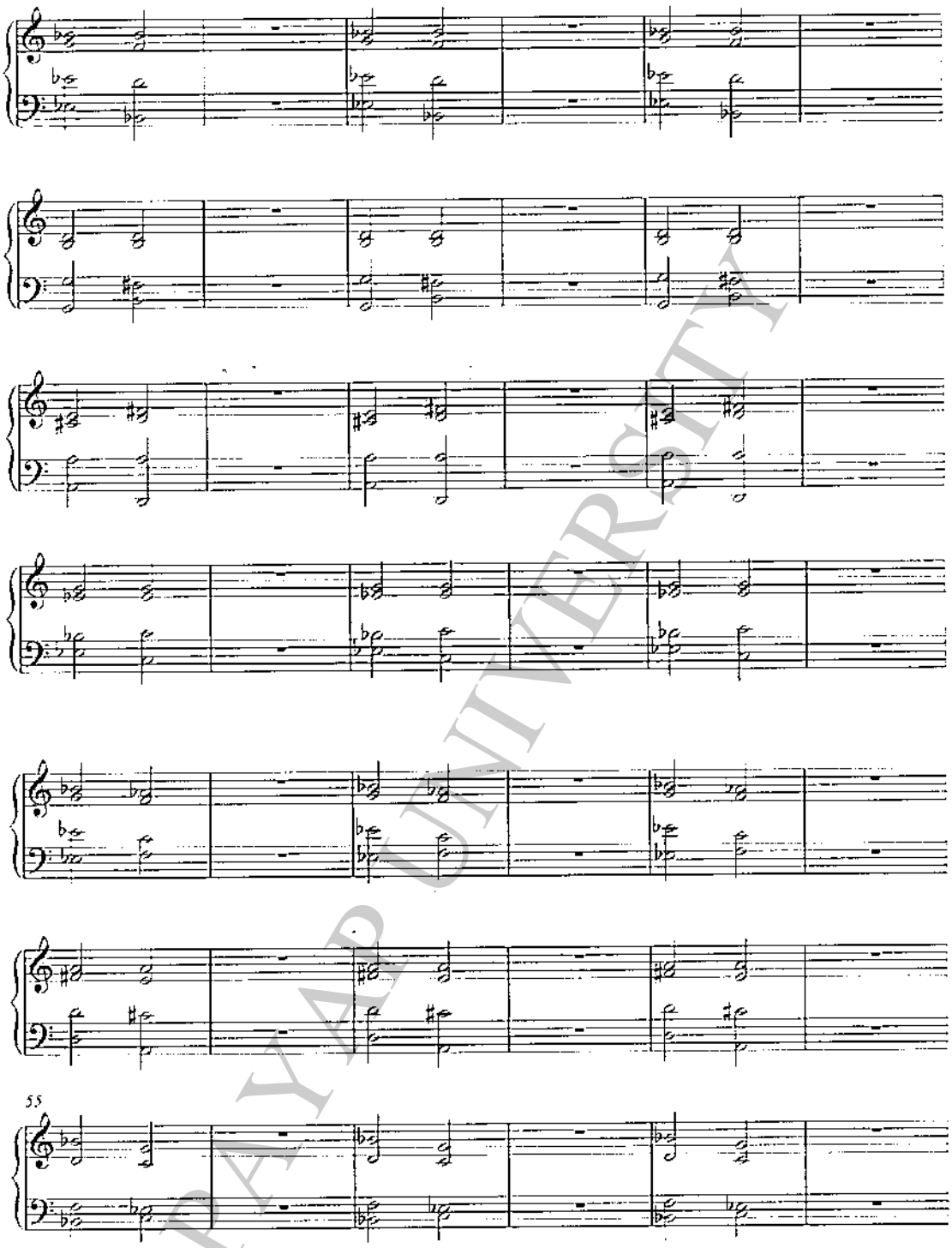

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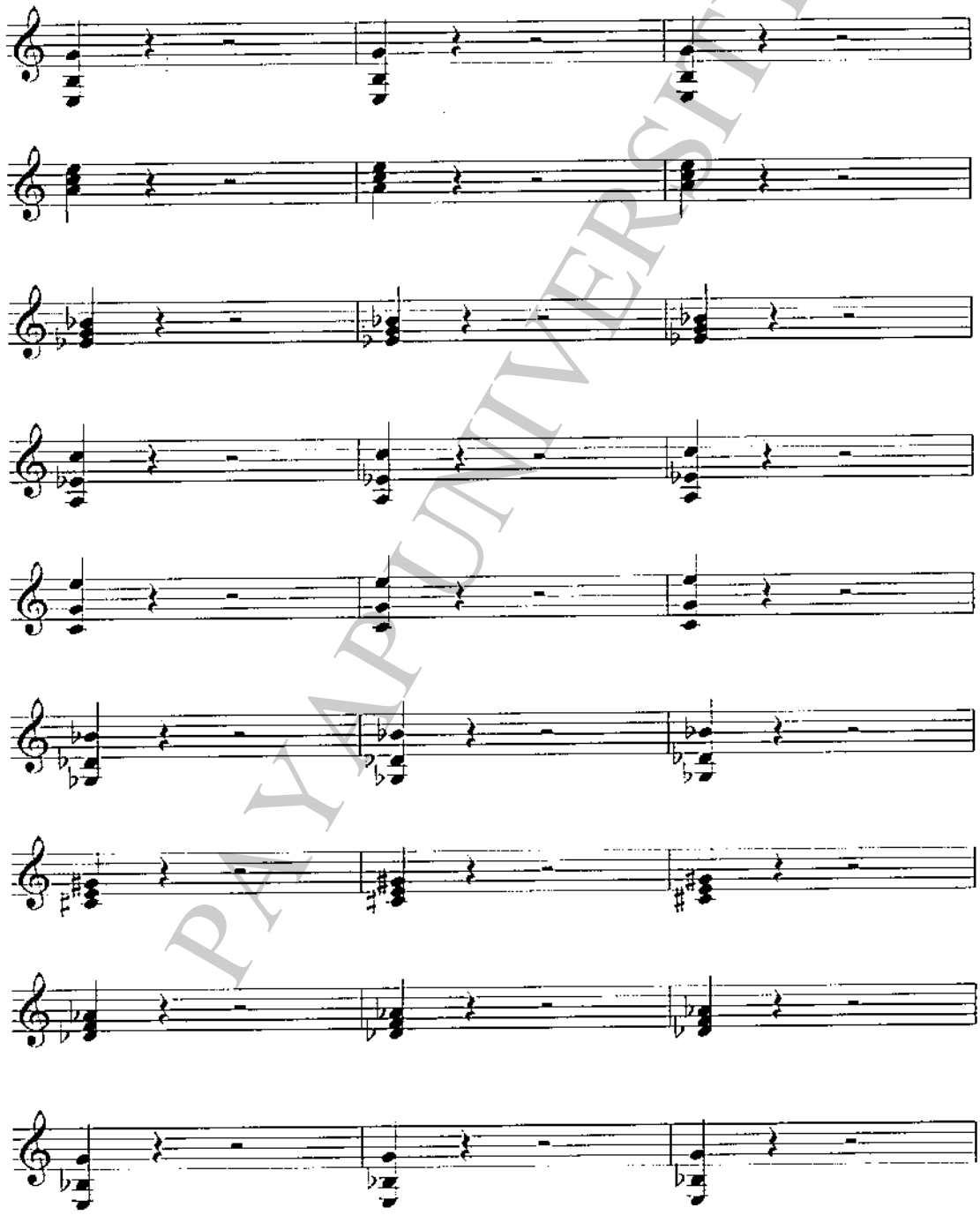
2. Chord quality

Conditions:

Items	Repeats	Delay	Level	Key Change	Contents
20	2	2	2	YES	Major - Minor

Ex B4



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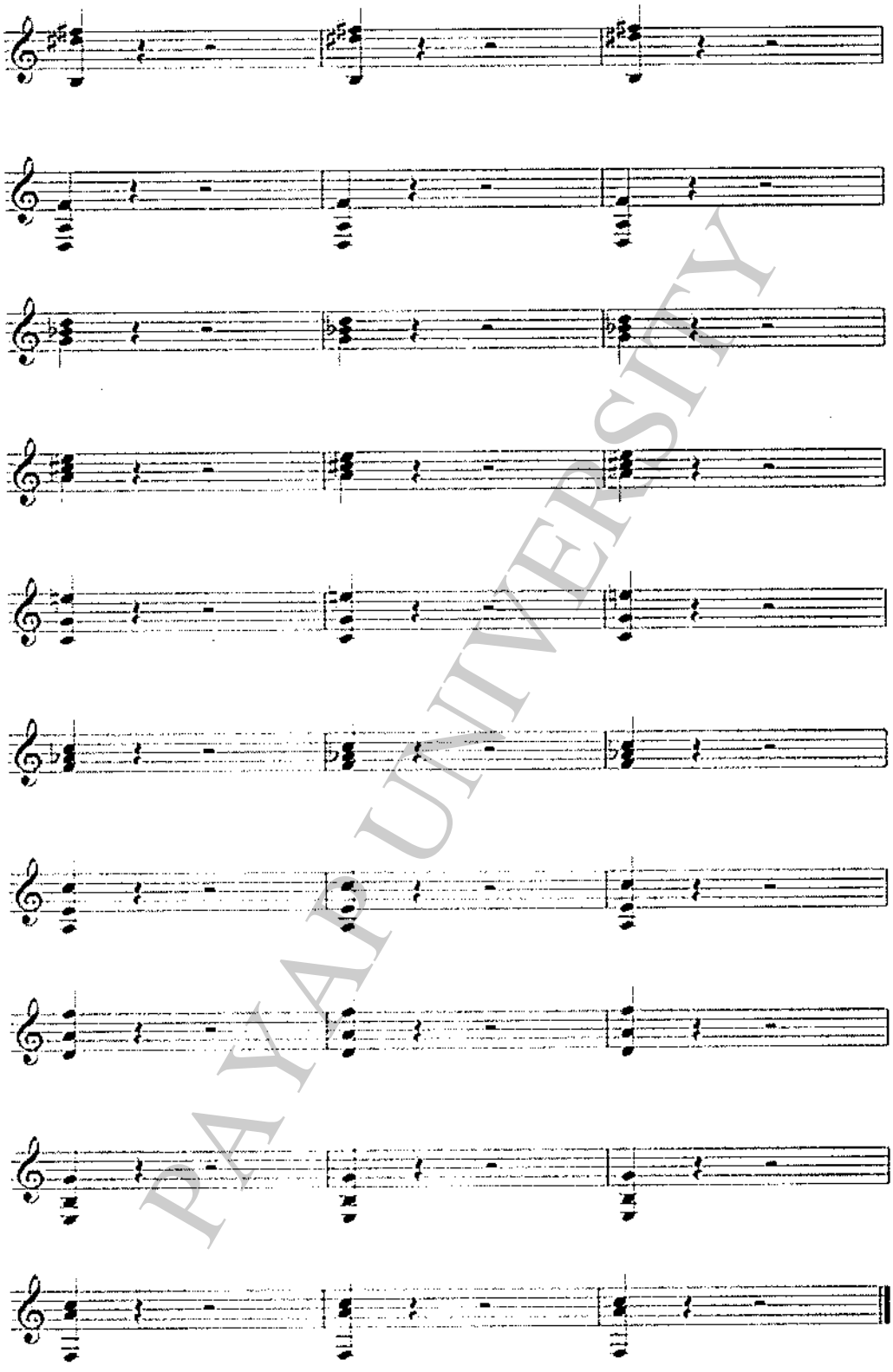

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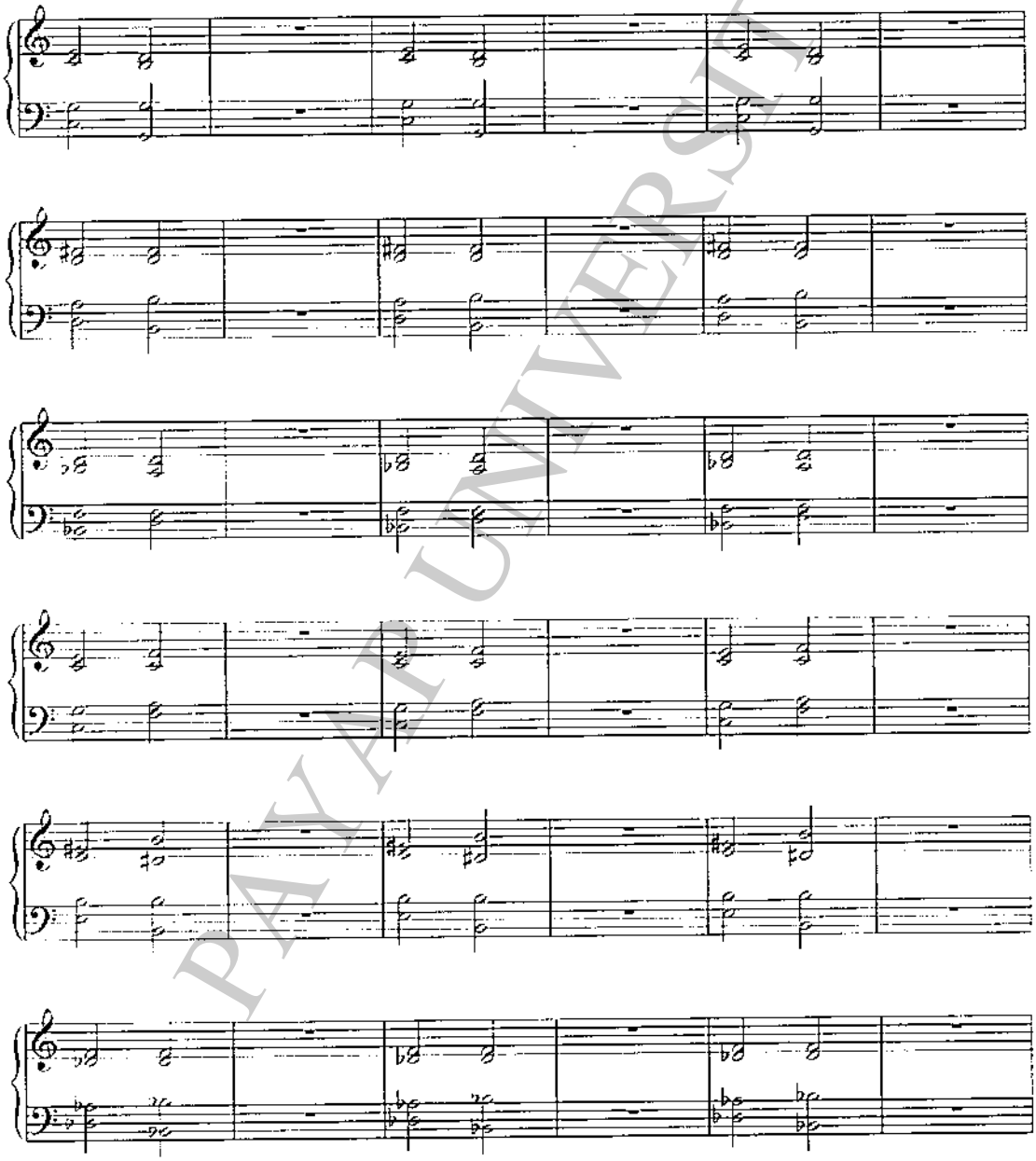
3. Chord progressions

Conditions

Items	Repeats	Delay	Chords per progression	Change of key	Progress
20	3	3	2	YES	S W

Ex C4



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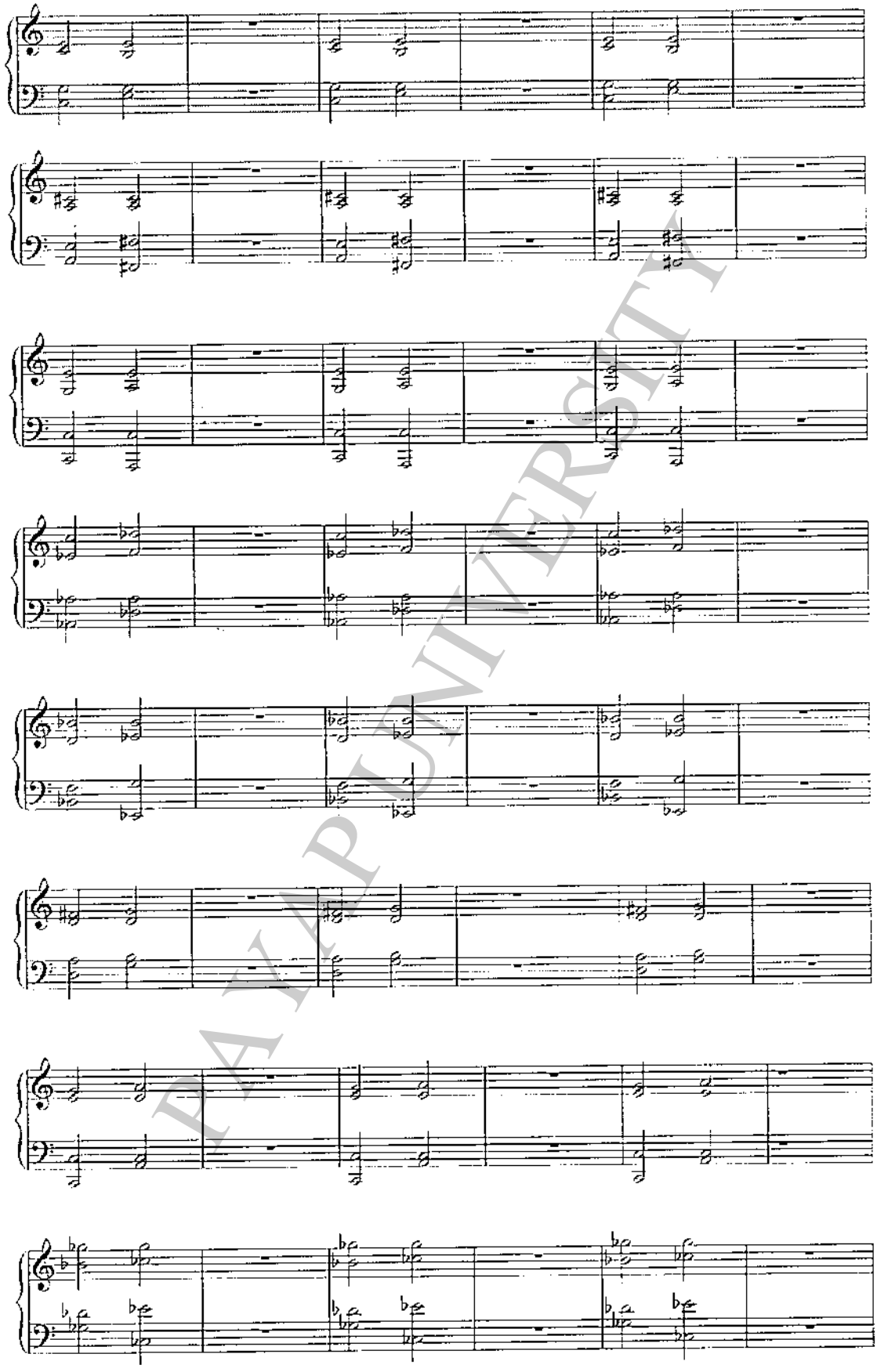

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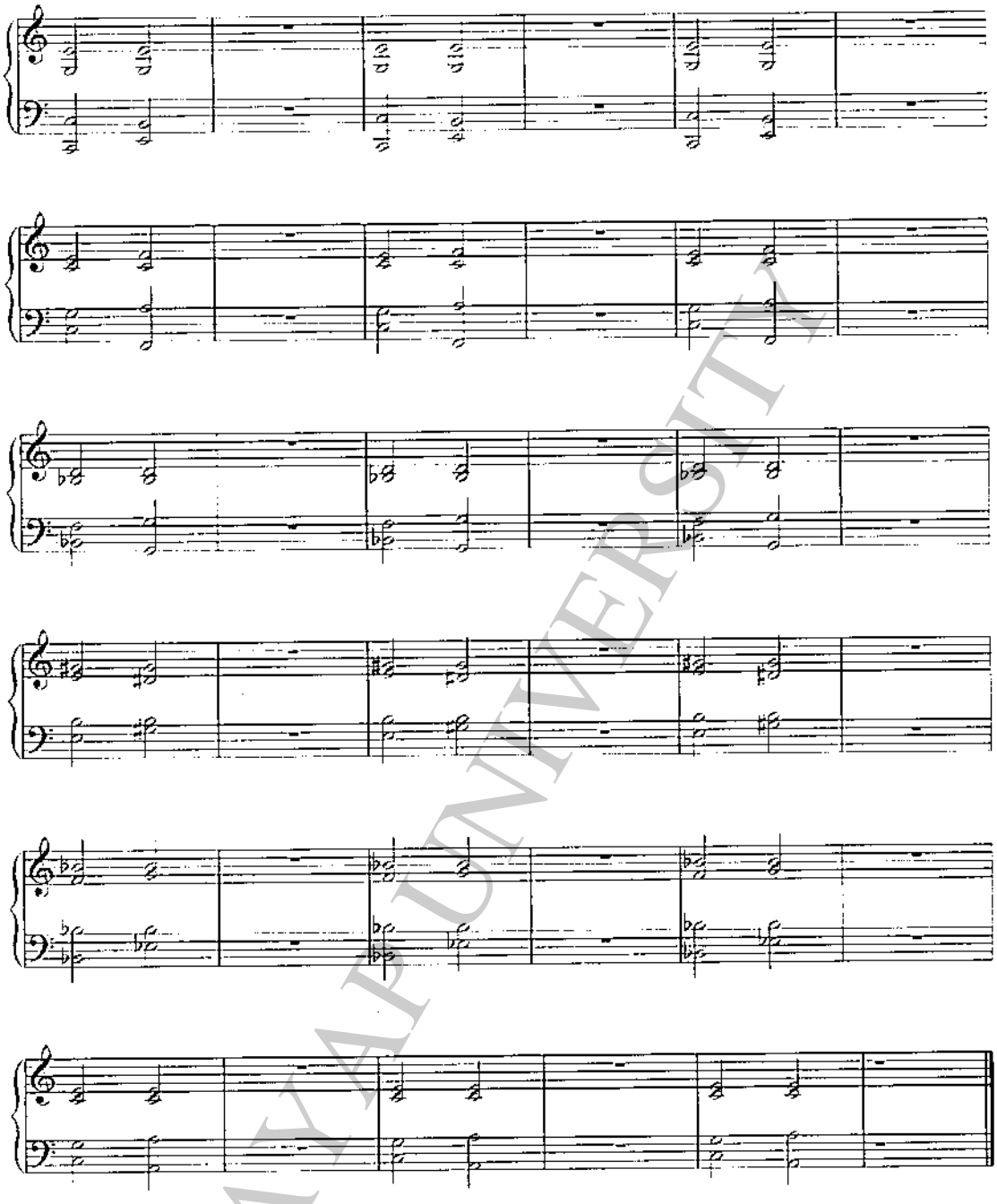

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Lesson 5

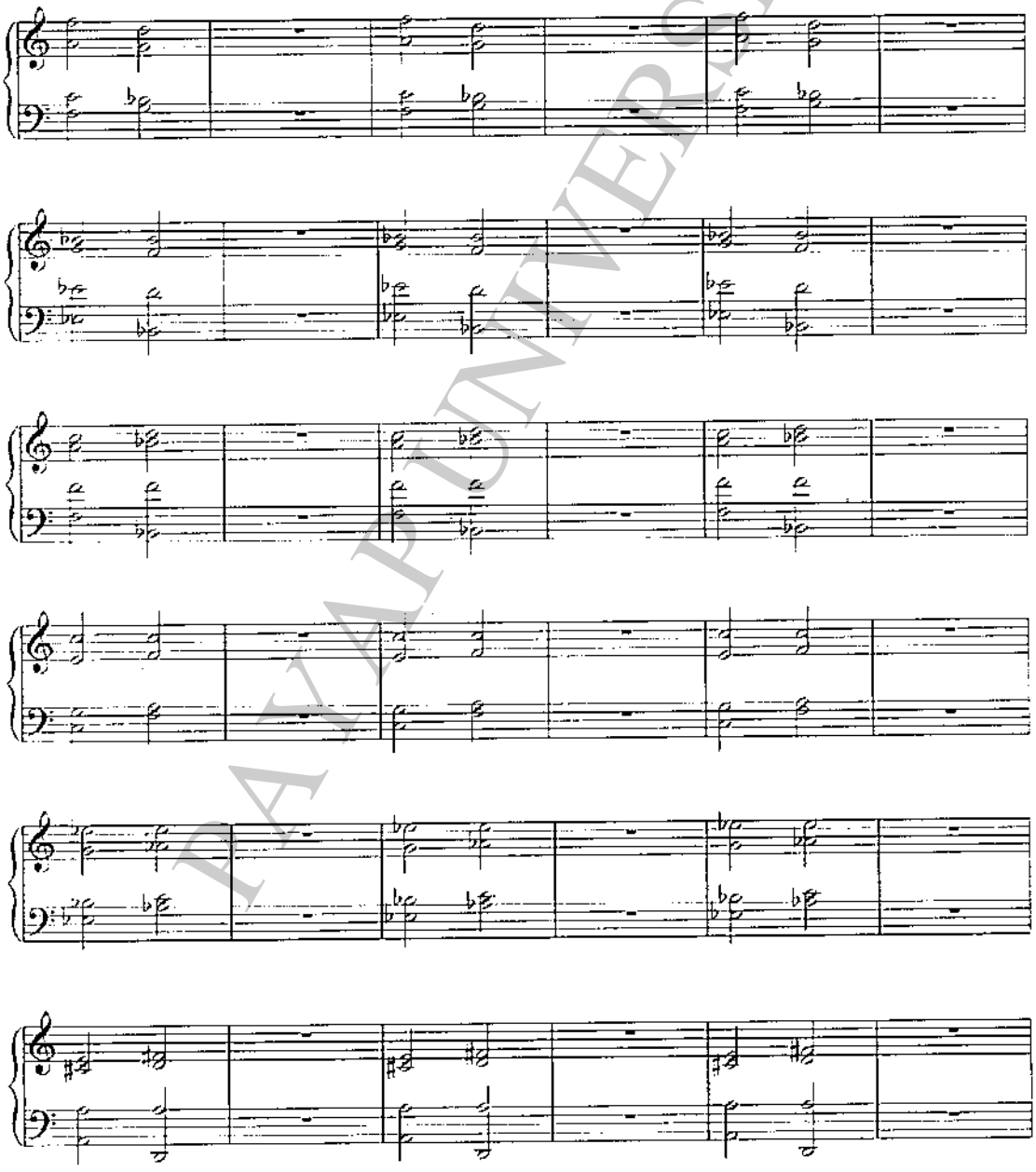
1. Chord progression type.

Conditions:

Items	Repeats	Delay	Chords per progression	Change of key	Types
10	2	3	2	YES	S W SS

Ex

A5



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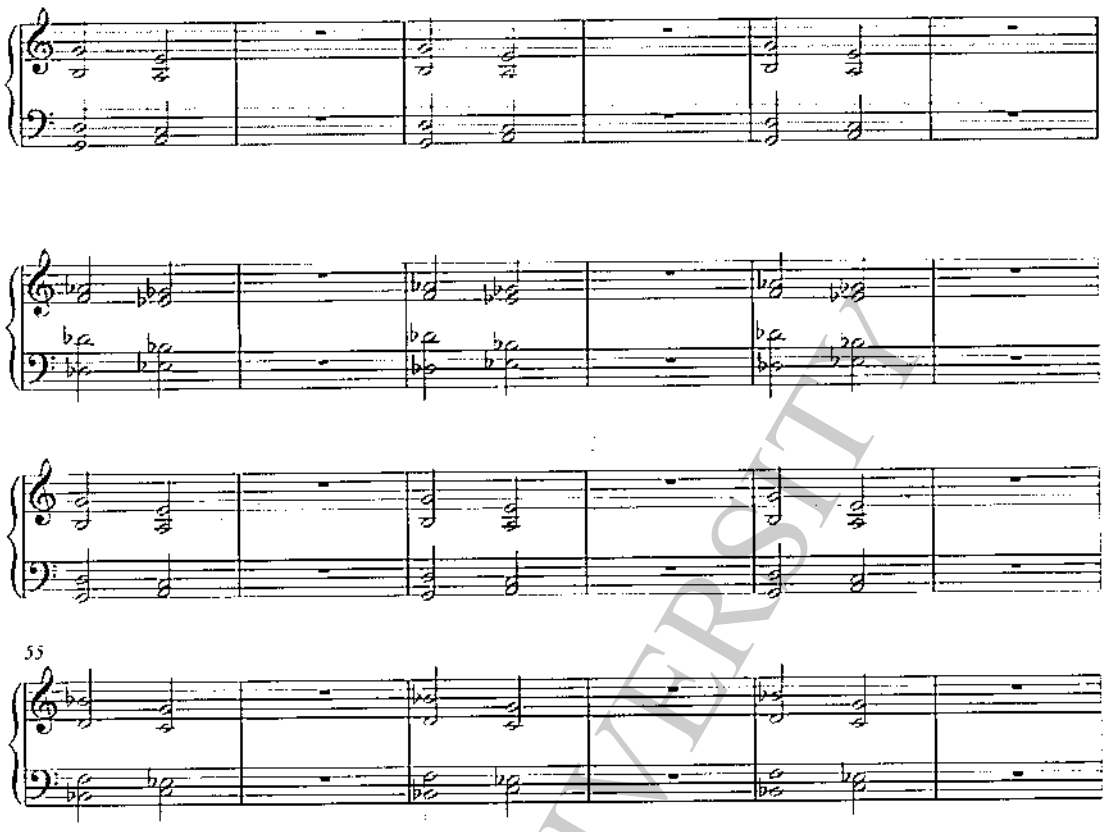

2. Chord quality

Conditions:

Items	Repeats	Delay	Level	Change of key	Contents
20	2	2		YES	Major-Minor

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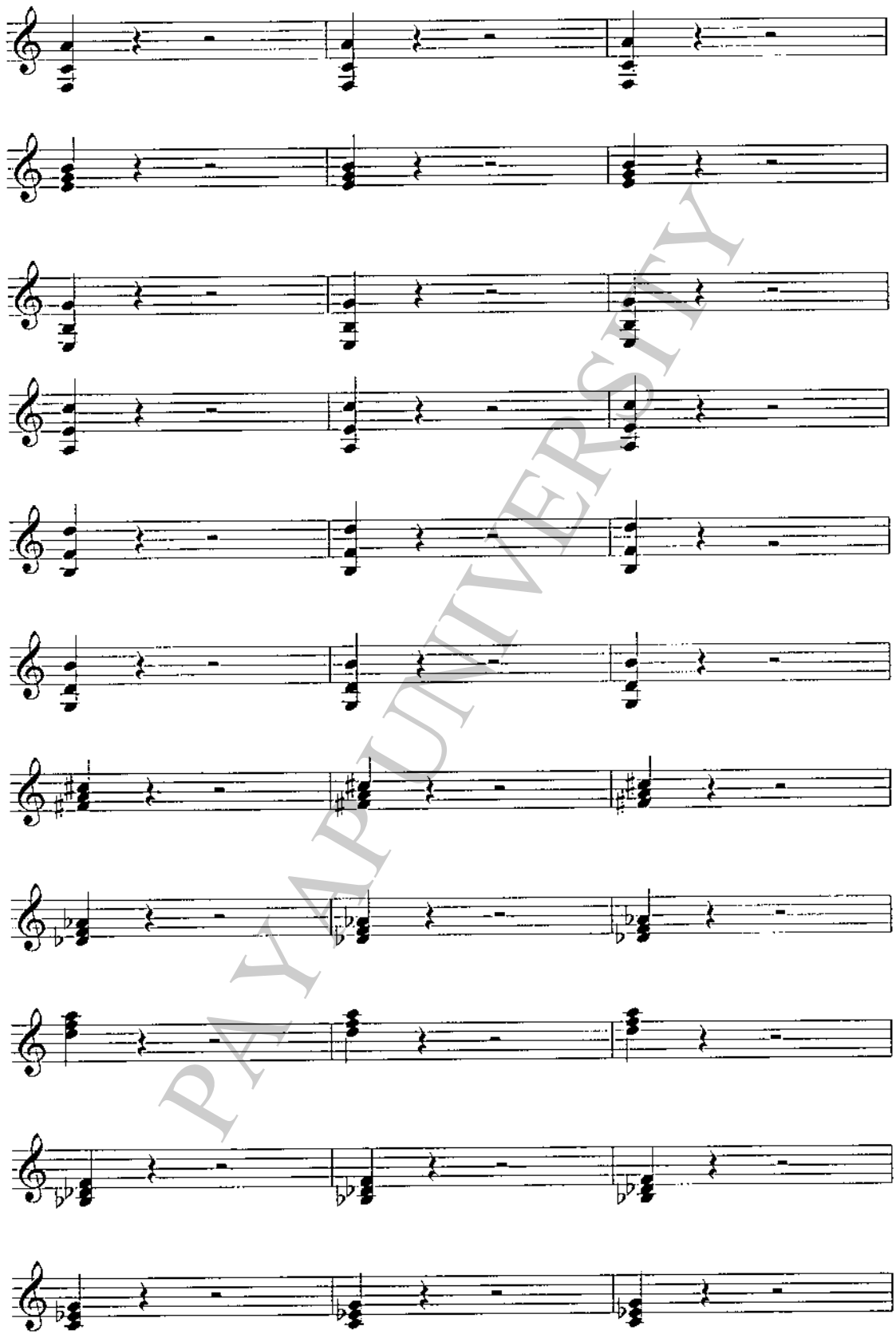
Ex B5



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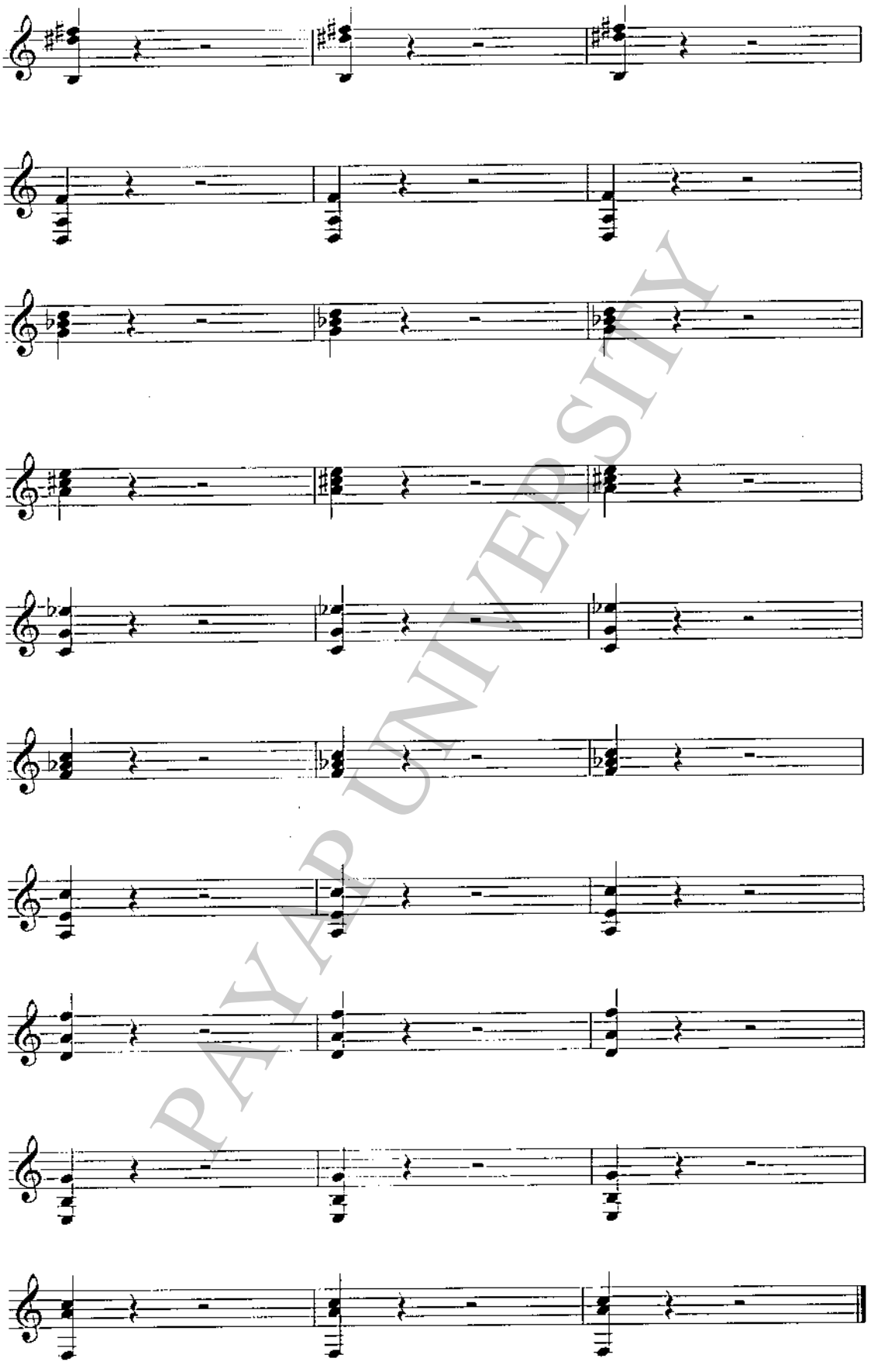

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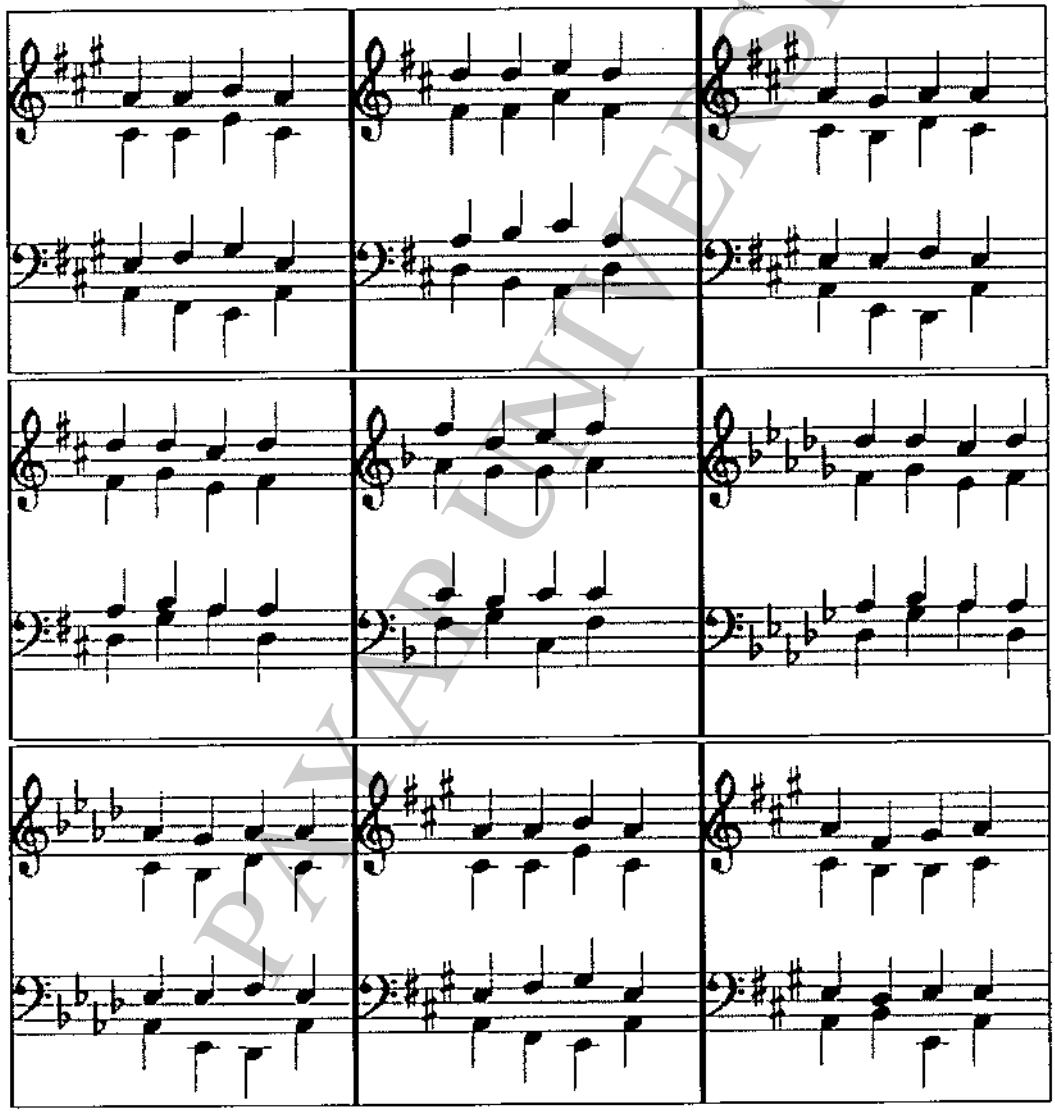
3. Chord progressions

Conditions

Items	Repeats	Delay	Chords per progression	Change of key	First chord
20	2	4	4	YES	S W SS

Ex C5



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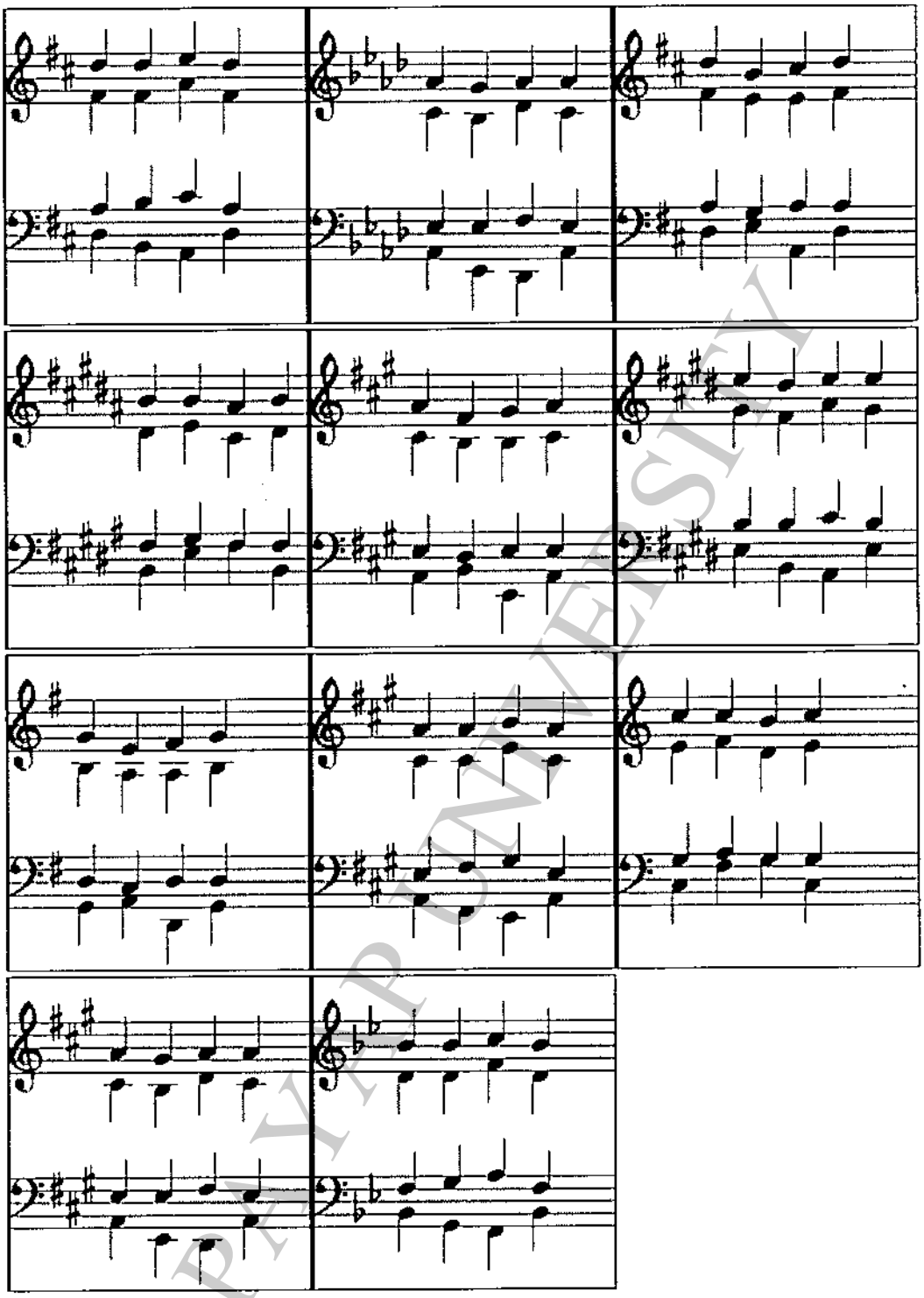

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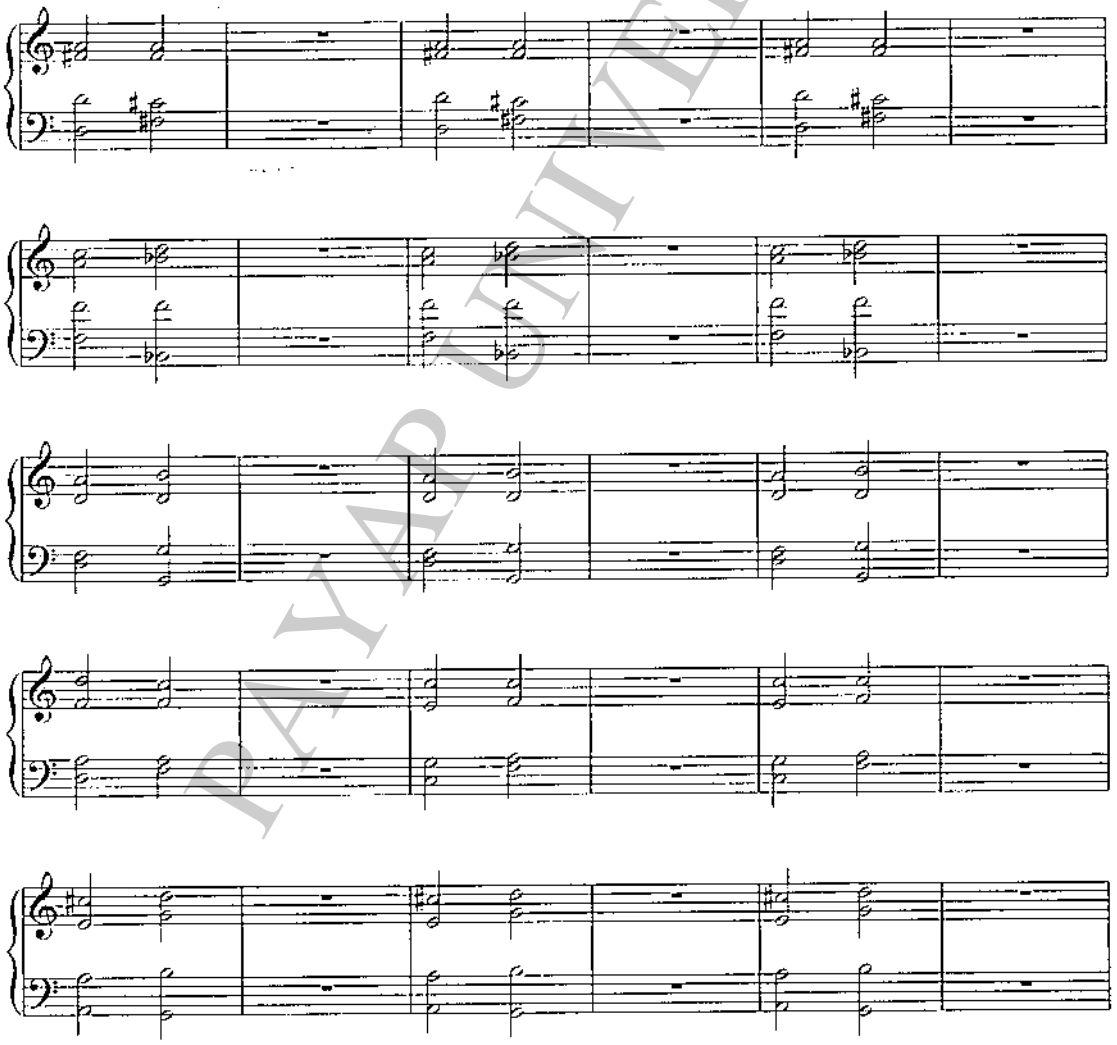
Lesson 6

1. Chord progression type.

Conditions:

Contents	Repeats	Delay	Chords per progression	Change of key	First chord
10	2	3	2	YES	I

Ex A6



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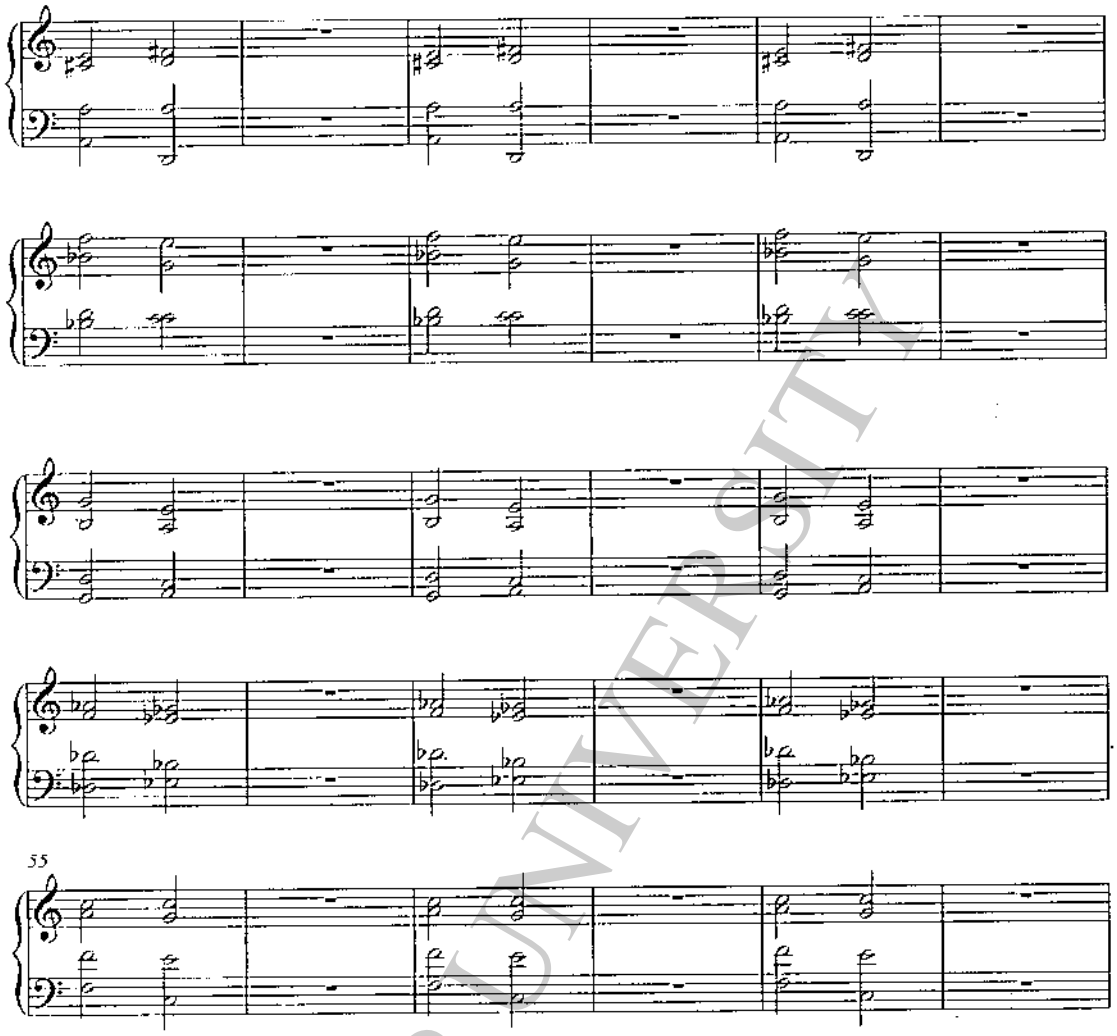

2. Chord quality

Conditions:

Items	Repeats	Delay	Level	Change of key	Contents
20	2	2	2	YES	Major - Minor

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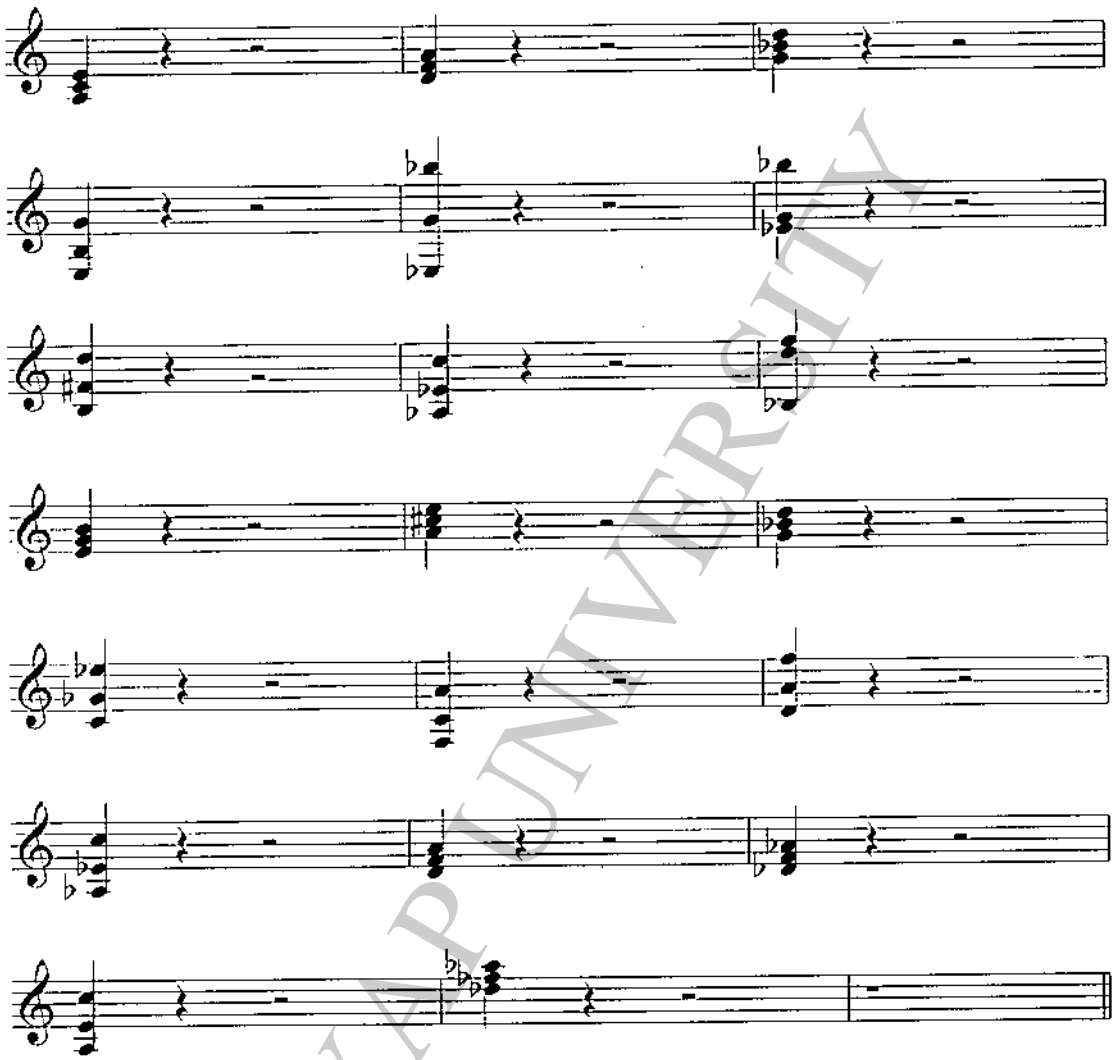
Ex B6



3. Chord progressions

Conditions:

Items	Repeats	Delay	Chords per progression	Change of key	Type
20	2	4	4	YES	S W SS

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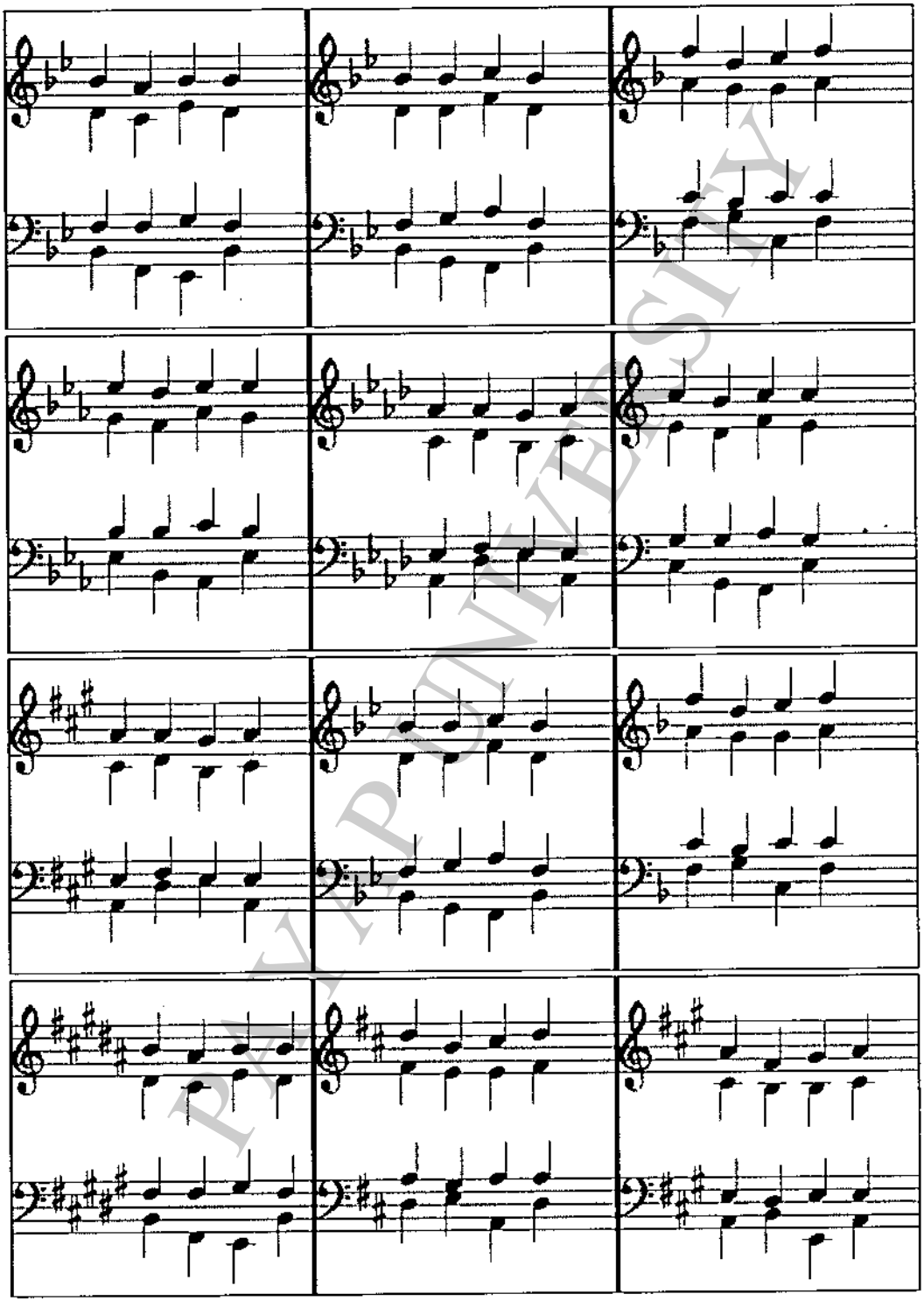
Ex C6



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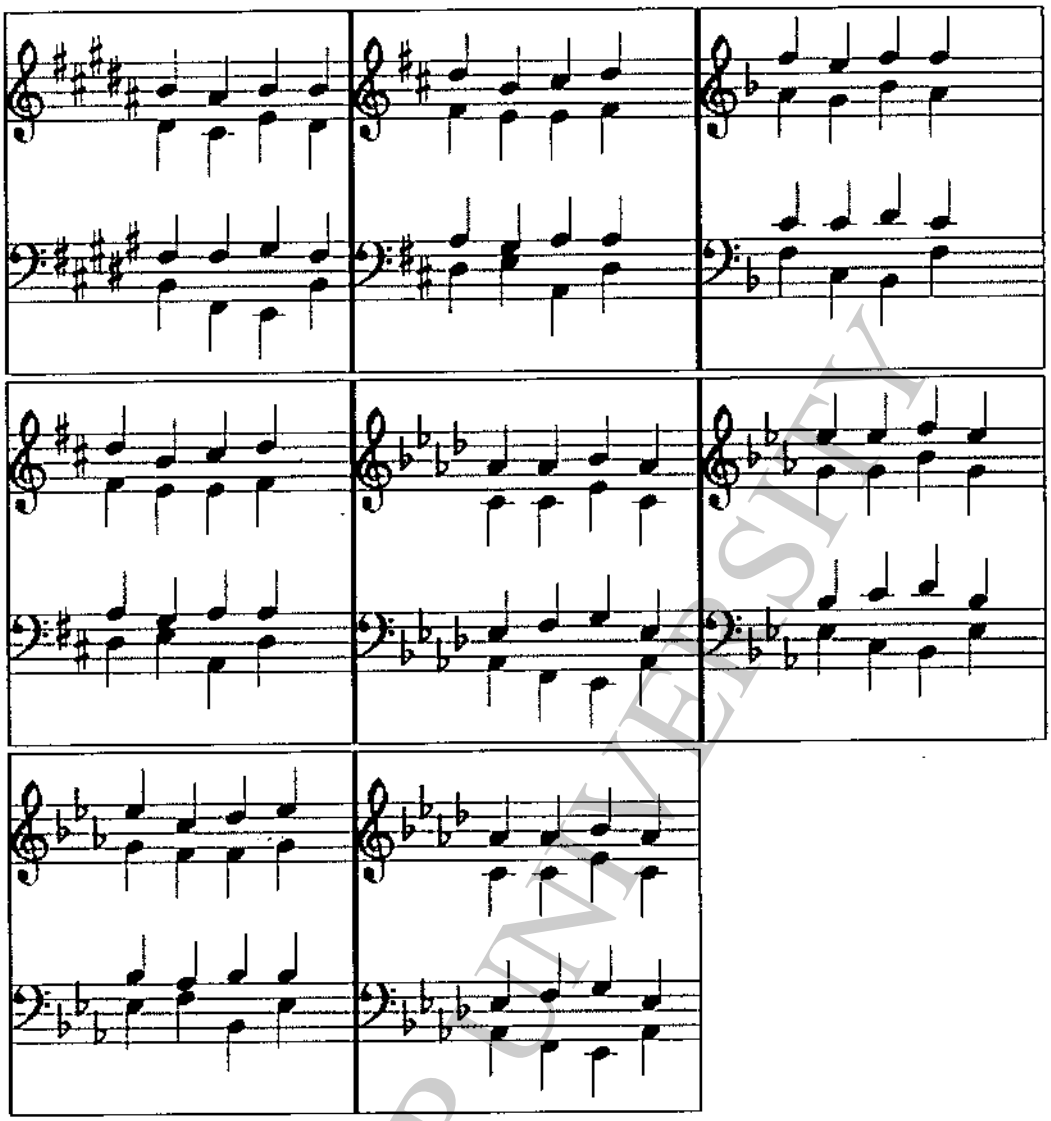

Lesson 7

1. Chord progression type.

Conditions:

Items	Repeats	Delay	Chords per progression	Change of key	Type
10	2	3	2	YES	S W SS

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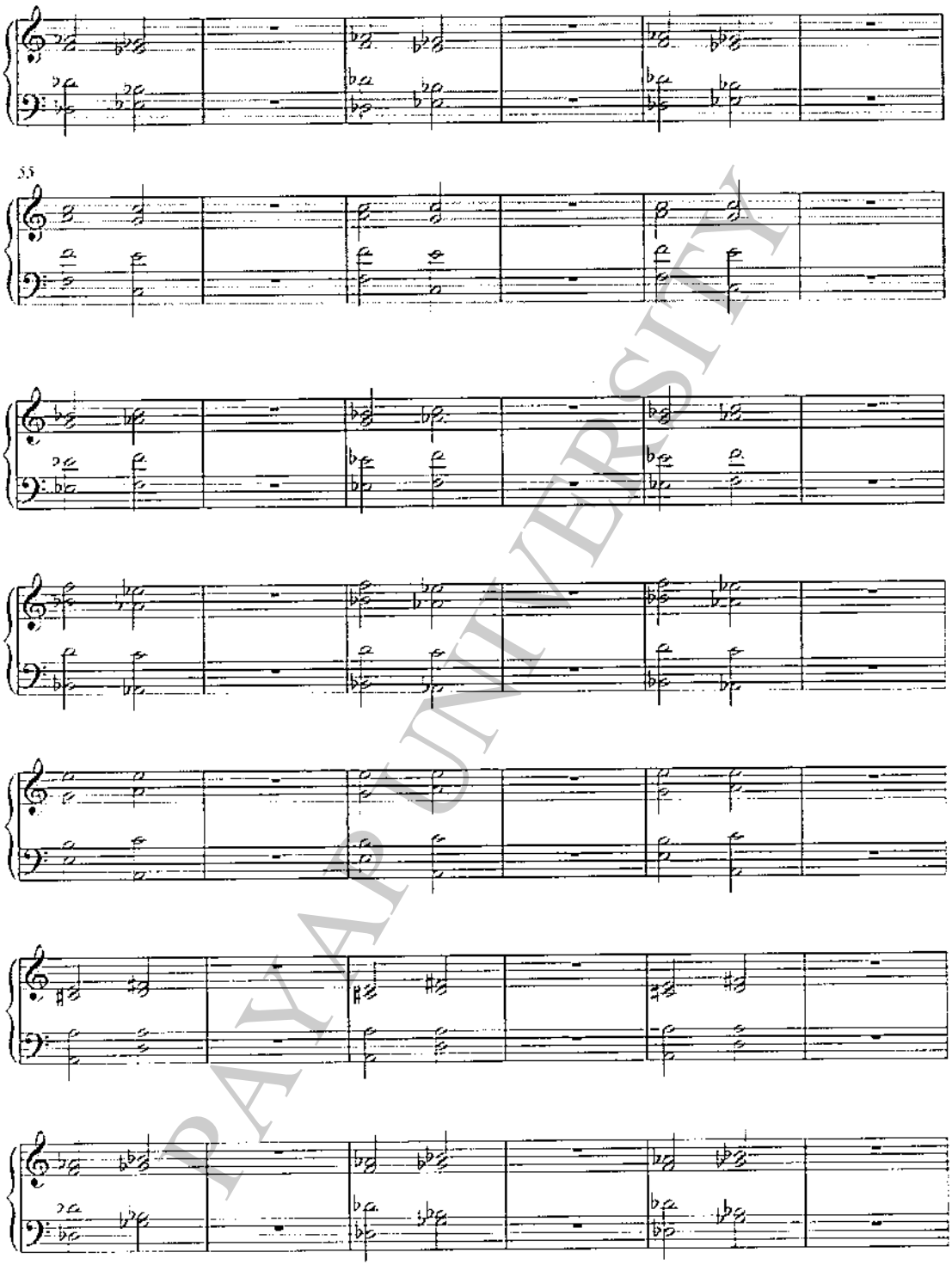
Ex

C7



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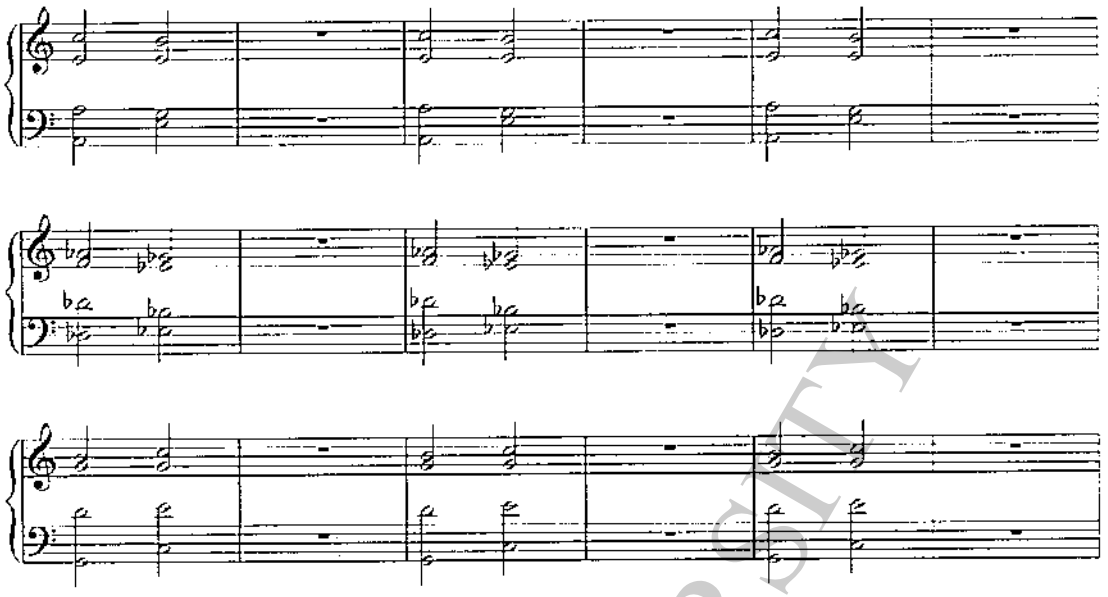
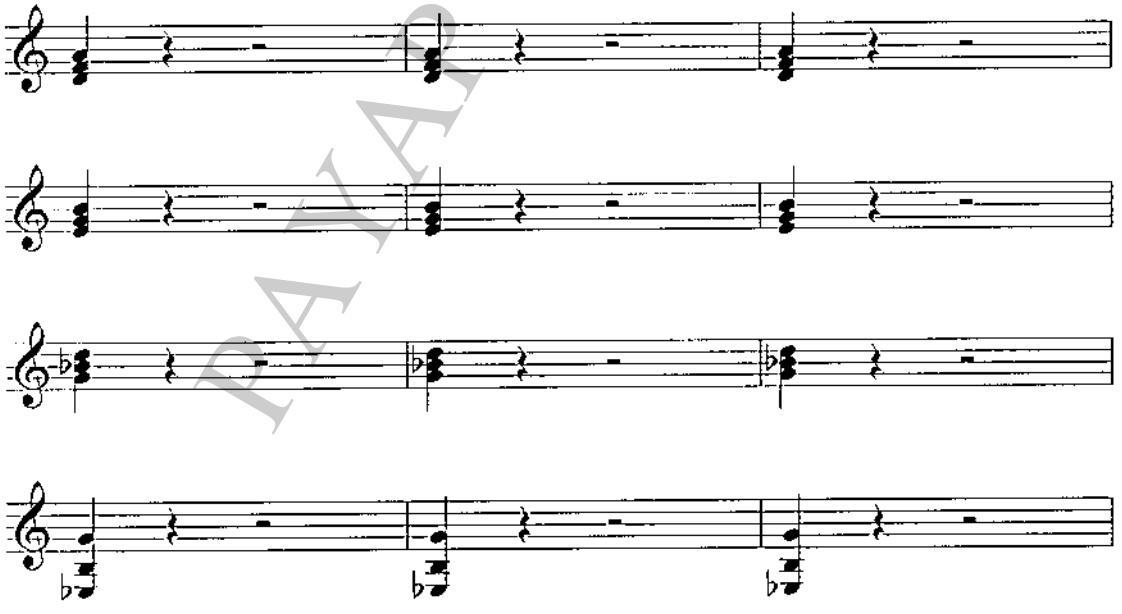


2. Chord quality

Conditions:

Items	Repeats	Delay	Level	Change of key	Contents
20 exercises	no	-	3	YES	Major - Minor

Ex B7



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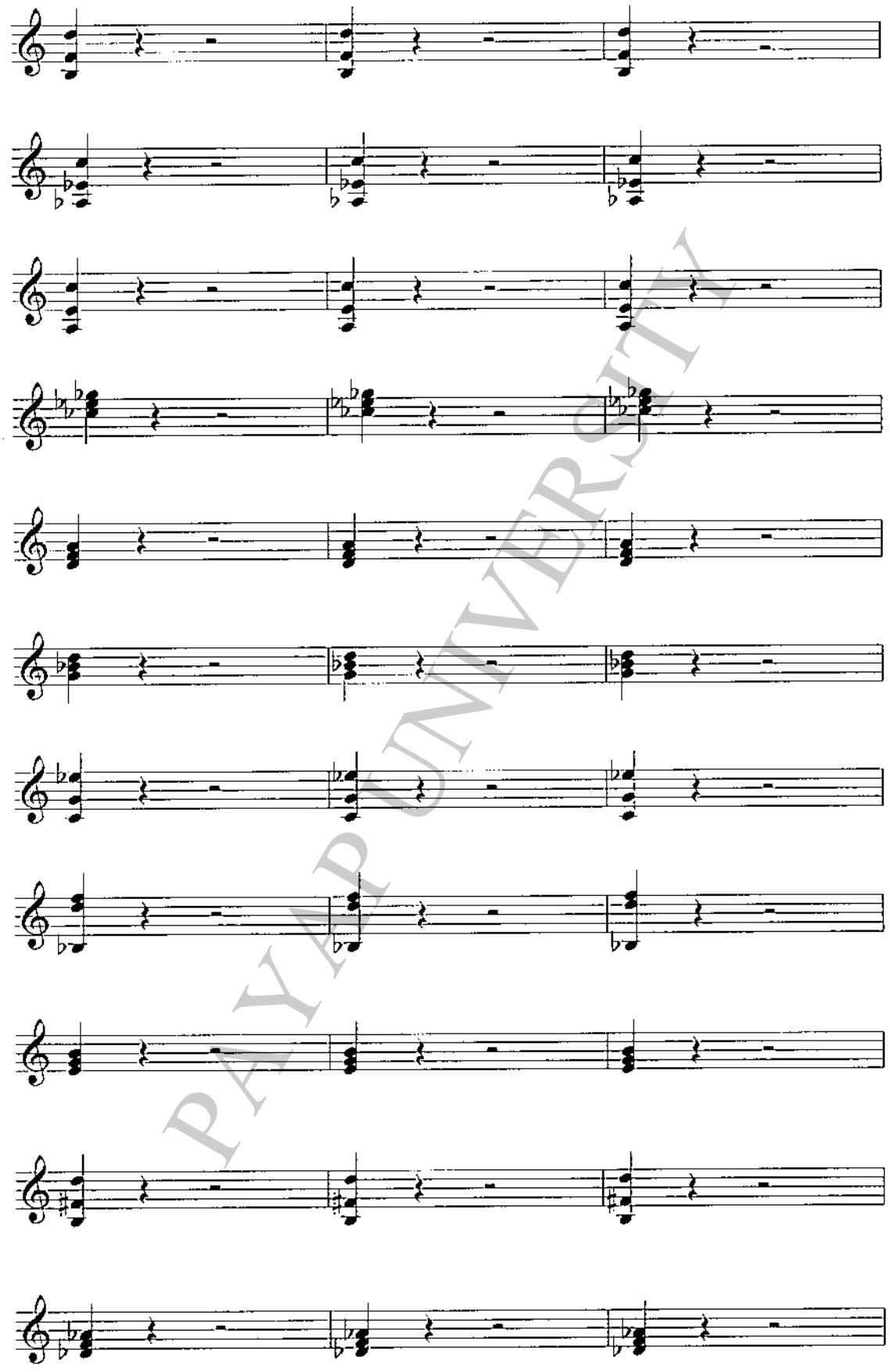
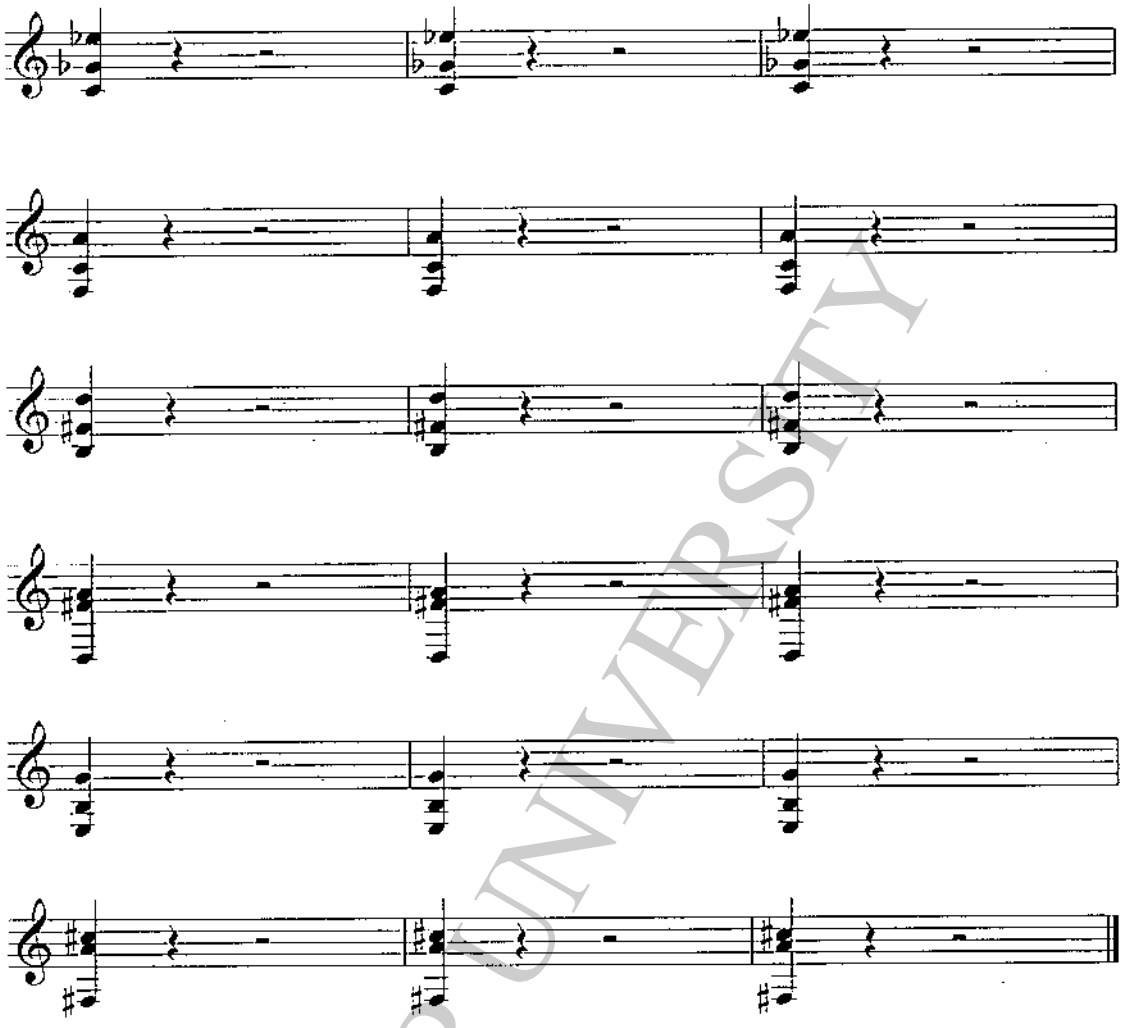


PAYAP UNIVERSITY



3. Chord progressions

Conditions:

Items	Repeats	Delay	Chords per progression	Change of key	Types
20	2	3	4	YES	S W SS

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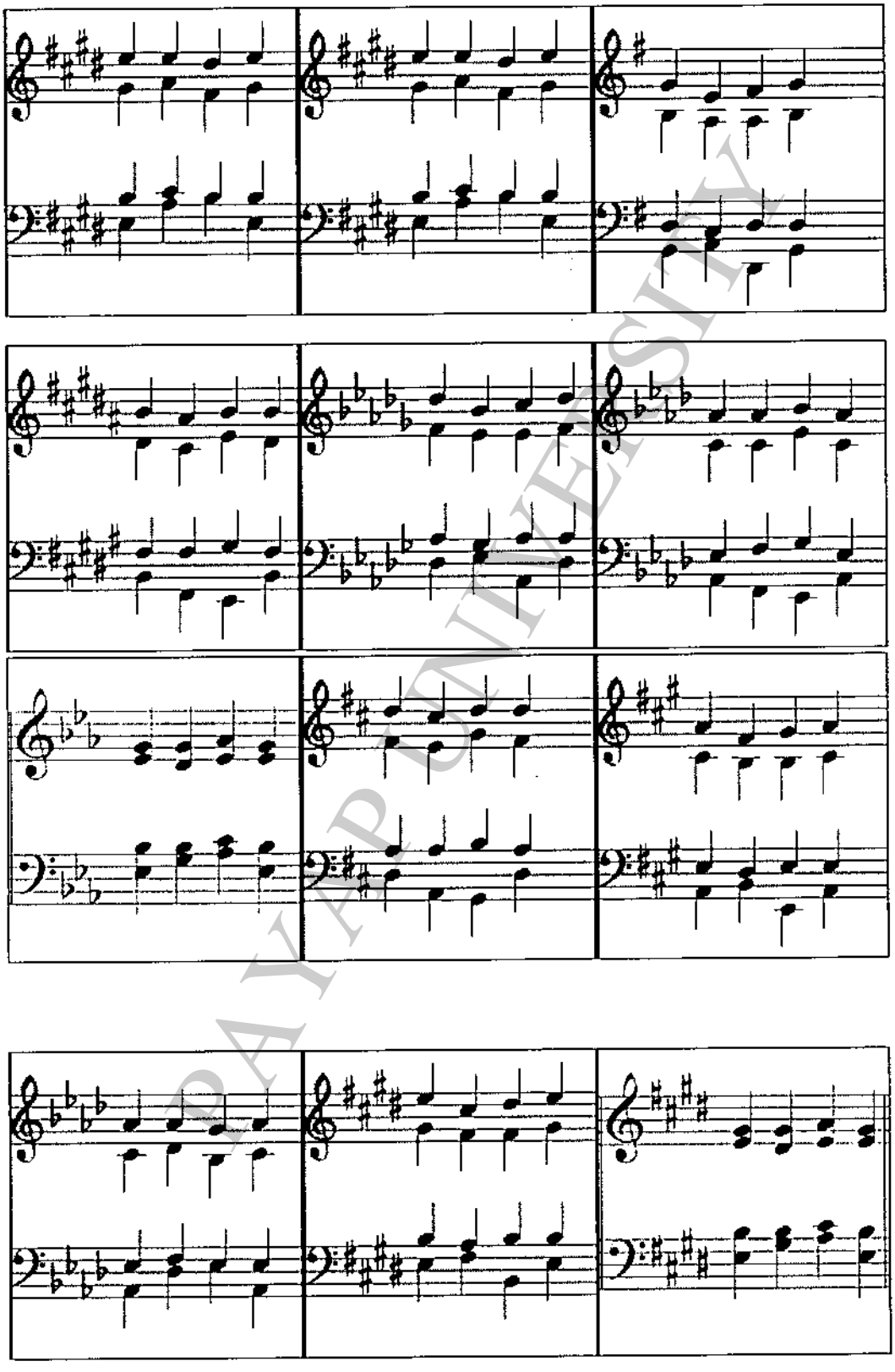
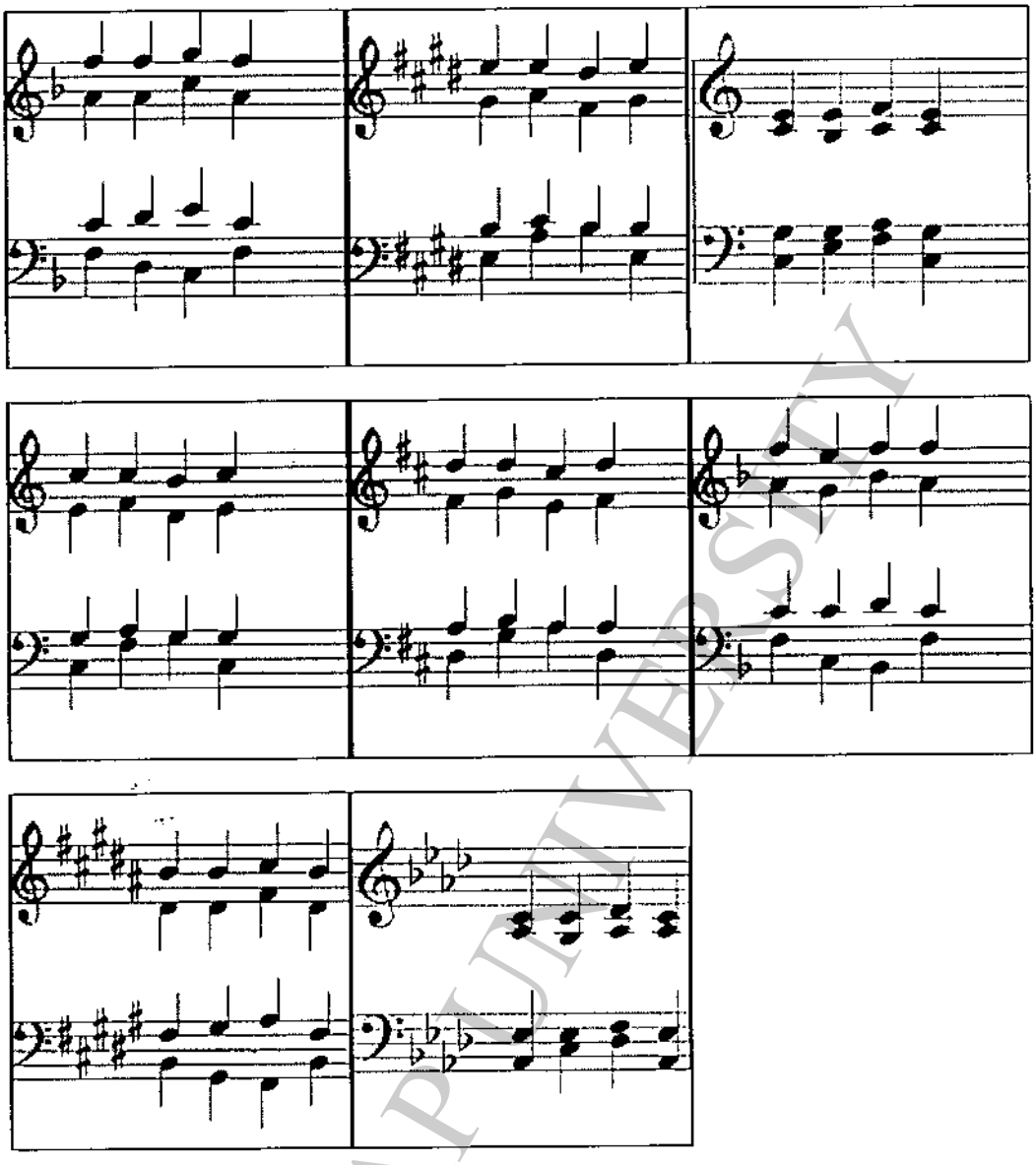
Ex C7



PAYAP UNIVERSITY



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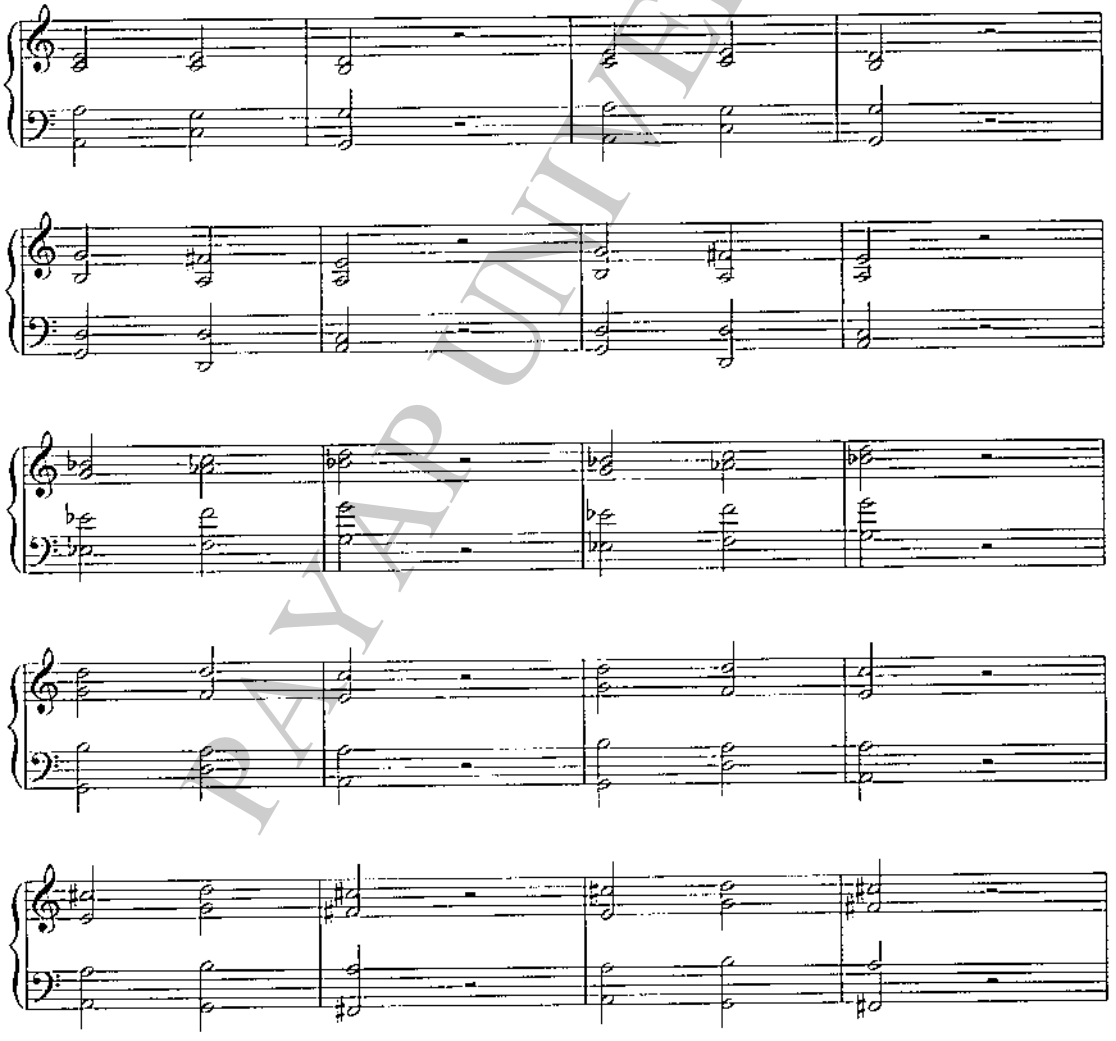
Lesson 8

1. Chord progression type.

Conditions:

Contents	Repeats	Delay	Chords per progression	Change of key	Types
10	1	3	3	YES	S W SS

Ex A8



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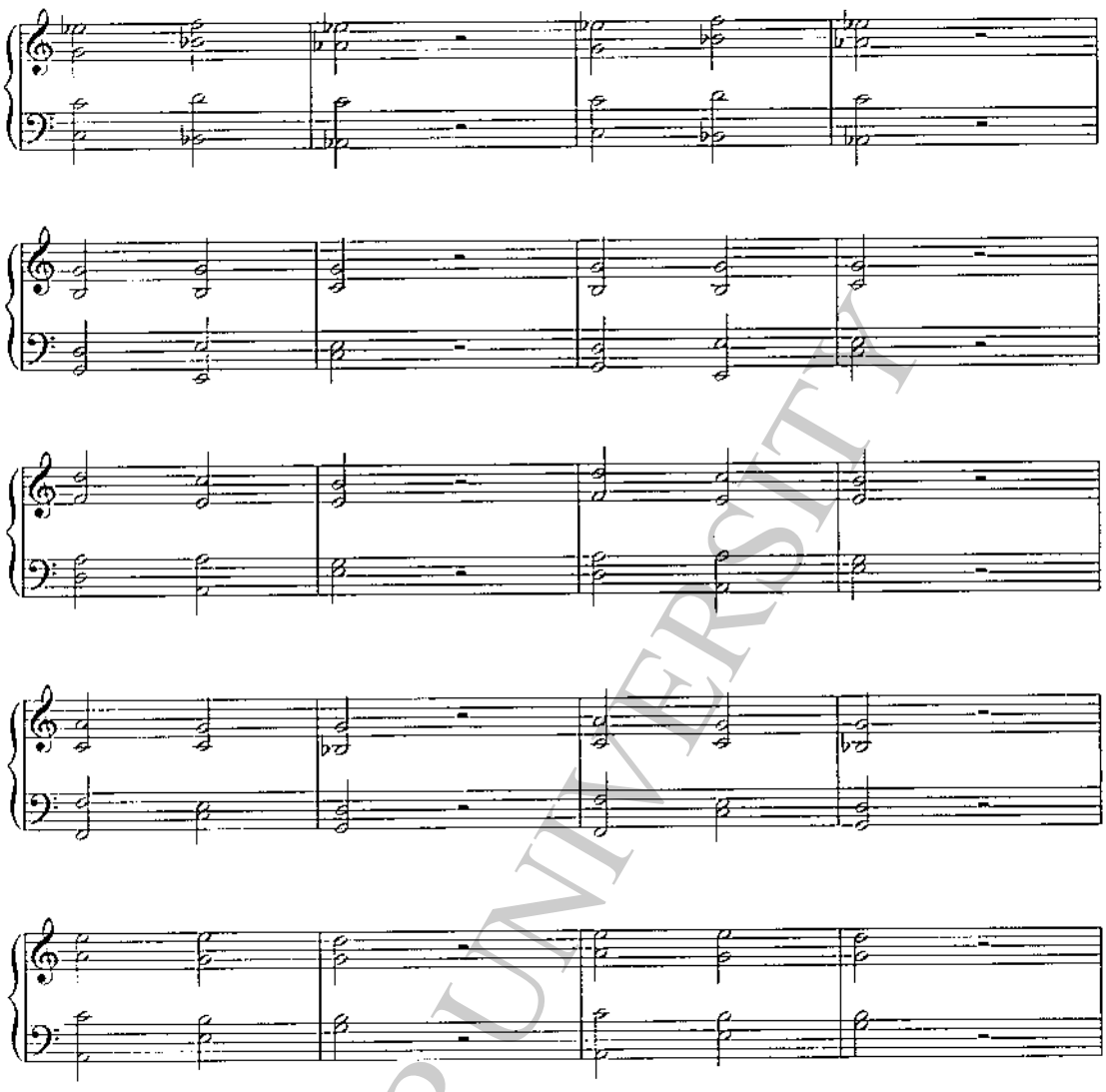

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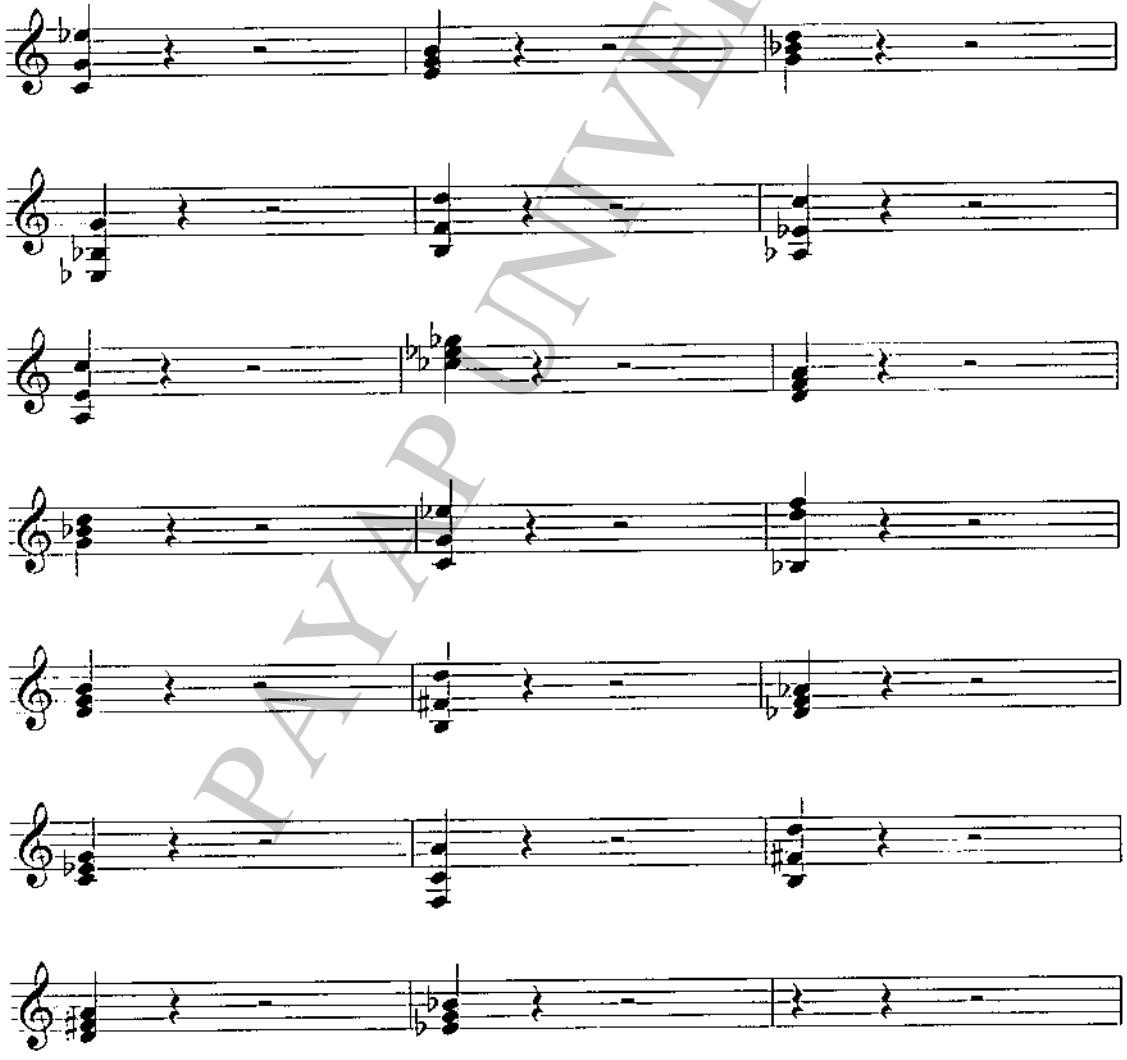
2. Chord quality

Conditions:

Items	Repeats	Delay	Level	Change of key	Contents
20 exercises	No	-	3	YES	Major-Minor

Ex B8



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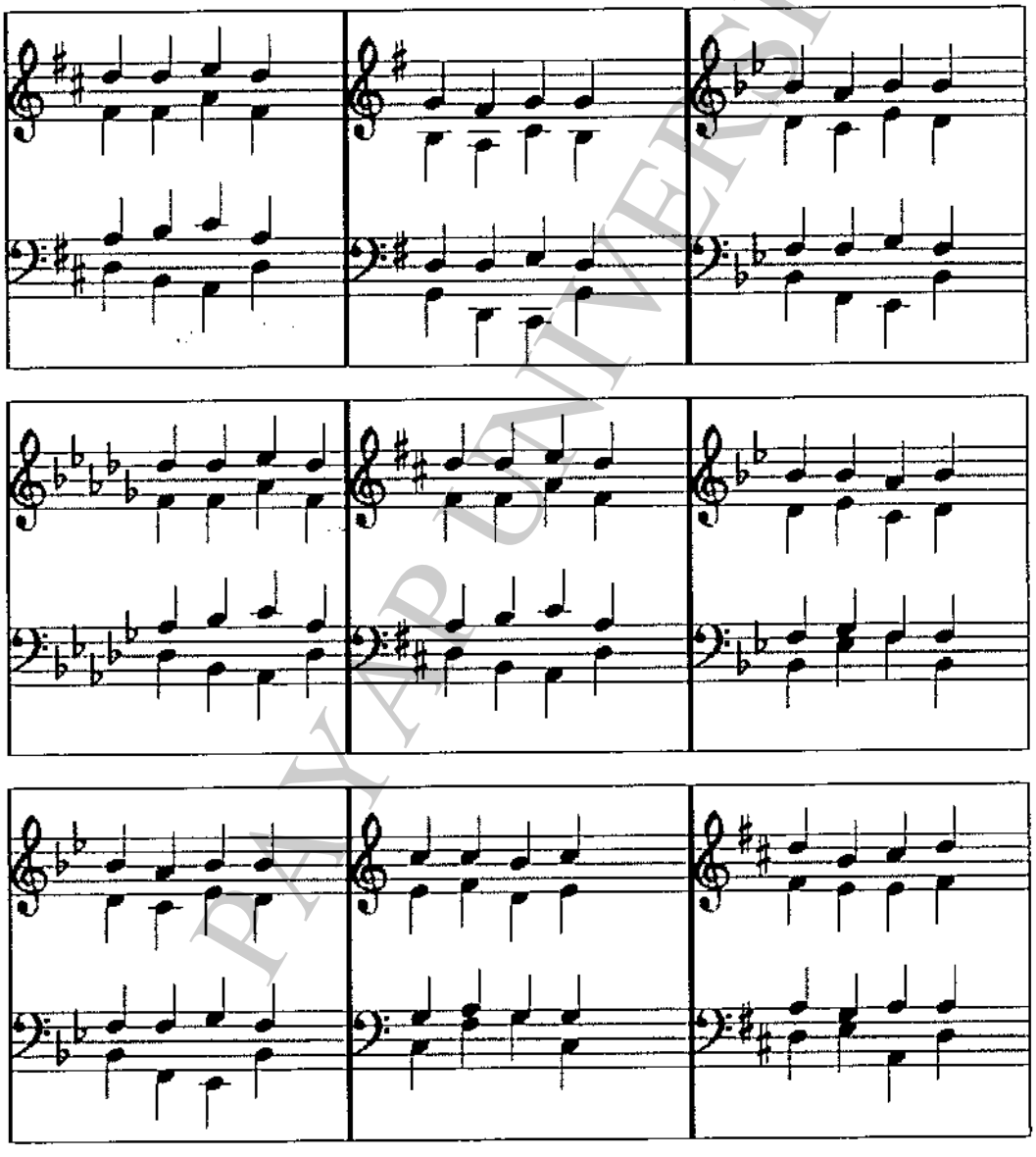
3. Chord progressions

Conditions:

Contents	Repeats	Delay	Chords per progression	Change of key	First chord
20	2	3	4	YES	I



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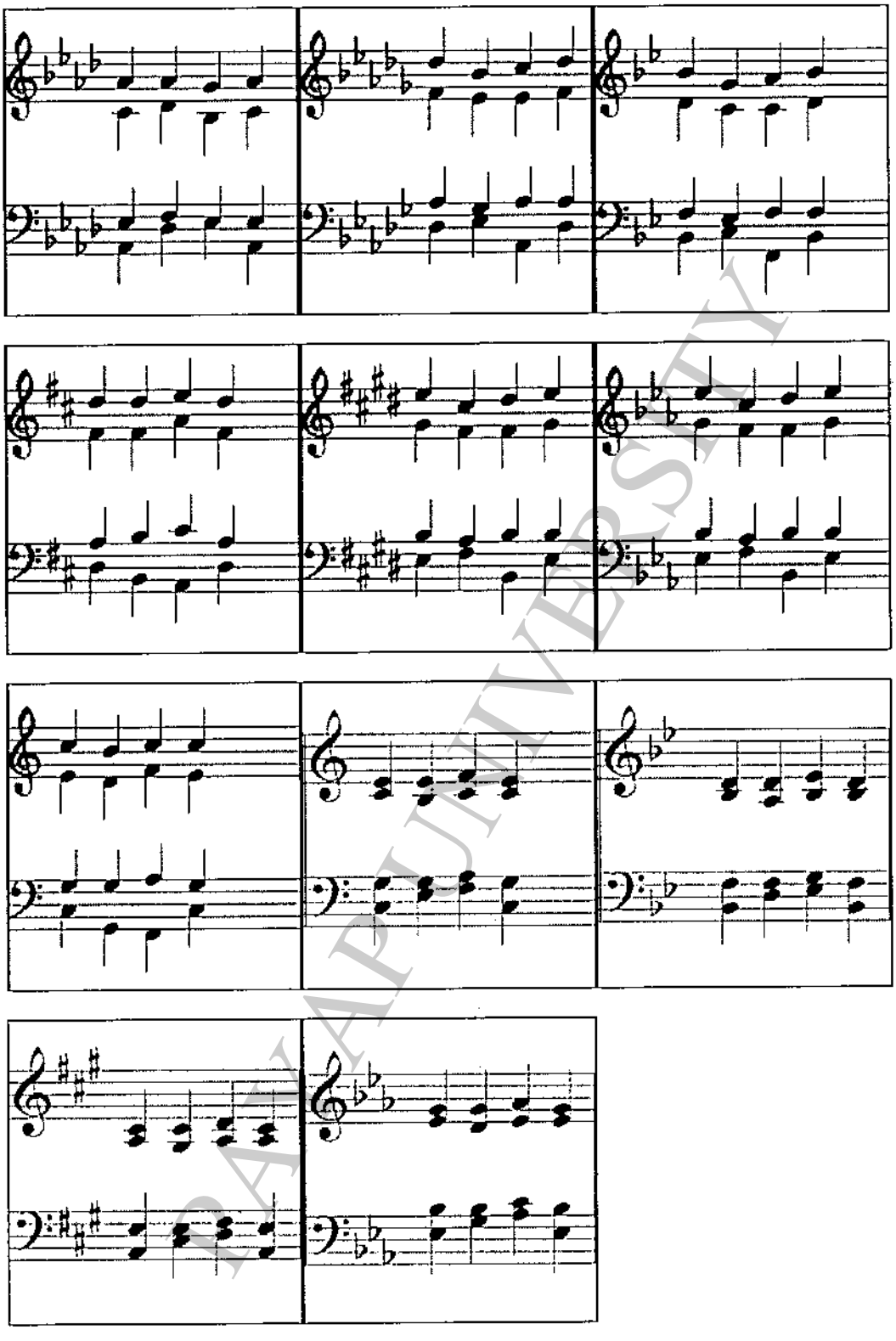

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3. Data analysis

This section is divided into four parts:

1. The pretest results
2. The posttest results
3. Two tests during the treatment
4. Comparing the pre and posttest

Pretest

At the pretest all 17 students from the sample group were present.

3 Students were deleted from the data because they were not present on the posttest, resulting in 14 subjects for analysis. (N=14)

The pretest, totaling 40 questions, consisted of two sections :

- Pre1 consisting of 10 questions (P1)
- Pre2 consisting of 30 questions (P2)

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The pretest results

N	P1	P2	Pretest Tot
1	7	15	22
2	9	25	34
3	9	23	32
4	7	17	24
5	5	12	17
6	6	17	23
7	7	21	28
8	6	15	21
9	9	26	35
10	9	21	30
11	7	13	20
12	8	25	33
13	7	11	18
14	8	18	26
Aver.	7.47	18.47	25.93
Aver. %	74.67	61.56	64.83

Grade C or less	50 %
Grade C+ and B	21.4 %
Grade B+ and A	28.6 %

Pretest results

The Average of all students was at 64.83%.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre Tot	14	17	35	25.93	5.88
Valid N	14				

Statiscics of the pretest

The Mean of the pretest of all students (N=14) was at 25.93.

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Posttest

The posttest (as with the pretest), consisted of two sections, totaling 40 questions :

- Pre1 consisting of 10 questions (P1)
- Pre2 consisting of 30 questions (P2)

N	post1	post2	post tot	post %
1	10	23	33	82.5
2	10	30	40	100
3	10	30	40	100
4	10	24	34	85
5	7	28	35	87.5
6	9	22	31	77.5
7	9	25	34	85
8	8	25	33	82.5
9	10	29	39	97.5
10	9	28	37	92.5
11	7	20	27	67.5
12	10	24	34	85
13	8	19	27	67.5
14	8	26	34	85
Aver.	8.93	25.21	34.14	85.36
Aver. %	89.29	84.05	85.36	85.36

Posttest results

The Average of all students was at 85.36%.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Post Tot	14	27	40	34.14	4.07
Valid N	14				

Statiscics of the posttest

The Mean of the posttests of all students (N=14) was at 34.14.

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Two tests during the treatment

To verify if students understand the contents; the exercises of lesson 5 and 7 have been evaluated (E2 and E3).
The requirement to be met is that at least 70% of the students need to score at least 65% on both tests. We succeeded in meeting these requirements.
The means (average for all students) of the evaluations were 78.14% (B+) for E1 and 87% (B+) for E2.

Requirement: After lesson 5, not less than 70% of the subjects should have a score of at least 65%, grade C+.

Results: (See Fig. 16 for more details)

N	E2 tot	E2 %	E3 tot	E3 %
1	35.50	71.00	nd	nd
2	50.00	100.00	48.00	96.00
3	40.50	81.00	50.00	100.00
4	46.00	92.00	nd	nd
5	34.50	69.00	nd	nd
6	37.50	75.00	45.00	90.00
7	37.00	74.00	nd	nd
8	34.50	69.00	43.00	86.00
9	50.00	100.00	50.00	100.00
10	44.00	88.00	48.00	96.00
11	30.00	60.00	31.00	62.00
12	36.50	73.00	42.00	84.00
13	31.50	63.00	35.00	70.00
14	39.50	79.00	43.00	86.00
Aver.	39.07	78.14	43.50	87.00

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Two tests during the treatment

Descriptive Statistics

	N	Mean	Mean %	Mean	Std. Deviation	Students< 65 %
E2 Tot.	14	39.07	78.14	39.07	6.33	14.28 %
E3 Tot.	14	43.50	87	43.50	6.31	14.28 %

Conclusion:

The data of the E2 test shows that:

1. 14.28 % of the students had a score of less than 65% (C or less), which is less than the maximum (30%).
2. The average score (Mean) of all students was at 78.14% (B+)

The data of the E3 test shows that:

1. 14.28 % of the students had a score of less than 65% (C or less), which is less than the maximum (30%).
2. The average score (Mean) of all students was at 87 % (B+)

Therefore the requirement that at least 70% of the students need to score more than 65% on both tests was met.

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Comparing the pre and post test.

The hypothesis states that the value of the posttest needs to be higher than the value of the pretest to be true. (Kiasuda, 2006)

N	Pre1	Pre2	Pre Tot	Pre %	post 1	post 2	post tot	post %	Incr. Test 1	Incr. Test 2	Incr. Tot %
1	7	15	22	55	10	23	33	82.5	3	8	27.5
2	9	25	34	85	10	30	40	100	1	5	15
3	9	23	32	80	10	30	40	100	1	7	20
4	7	17	24	60	10	24	34	85	3	7	25
5	5	12	17	42.5	7	28	35	87.5	2	16	45
6	6	17	23	57.5	9	22	31	77.5	3	5	20
7	7	21	28	70	9	25	34	85	2	4	15
8	6	15	21	52.5	8	25	33	82.5	2	10	30
9	9	26	35	87.5	10	29	39	97.5	1	3	10
10	9	21	30	75	9	28	37	92.5	0	7	17.5
11	7	13	20	50	7	20	27	67.5	0	7	17.5
12	8	25	33	82.5	10	24	34	85	2	-1	2.5
13	7	11	18	45	8	19	27	67.5	1	8	22.5
14	8	18	26	65	8	26	34	85	0	8	20
Mean	7.43	18.50	25.93	64.82	8.93	25.21	34.14	85.36	1.50	6.71	20.54
%	74.29	61.67	64.82	64.82	89.29	84.05	85.36	85.36	15	22.36	20.54

Comparison of the pre and post tests

Conclusion:

1. The mean of the posttest is higher than the pretests' mean.
   The average increase of the mean was 20.54%.
2. The increase was significant in all but one student. (SeeFig. 12)
   The student with the biggest improvement was at 45% and the lowest was 2.5%.
   (the student with the lowest improvement already had a high score at the pretest)
3. At the pretest 50% of the students had a grade of C and less.
4. At the posttest none of the students had a grade of C and less and 14% had a score of C+.

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