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Title: Raqm Numerals: A Model for Encoding the Siyaq System of South Asia
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1 Introduction

The intent of this document is to determine models for encoding numerals of the Siyaq notation system in the Universal Character Set (ISO/IEC 10646). It does so through an analysis of the Raqm Numerals, the Siyaq sub-system used in South Asia.

This document draws upon information originally presented in L2/07-414 “Proposal to Encode Siyaq Numerals in ISO/IEC 10646” (December 2007). In L2/07-414, the present author analyzed the four Siyaq traditions and recommended a unified encoding for the numerals of these sub-systems. Further research has indicated that although the numerals of the Diwani, Ottoman, Persian, and South Asian traditions are based upon a common pattern, there are sufficient differences in character typology and orthography to warrant the independent encoding for the numerals of each sub-system.

This document is intended to stand in comparison to L2/09-140 “Diwani Numerals: Towards a Model for Encoding Numerals of the Siyaq Systems” (April 2009). In L2/09-140, the present author described the Diwani Numerals, which possesses the smallest character repertoire of the four sub-systems and the least technical requirements for shaping and other rendering behaviors. The presentation here of the Raqm system may be compared with that of the Diwani Numerals in order to understand not only the differences in the character typology of the numerals of the Siyaq family, but also the locale-specific linguistic factors that differentiates the Siyaq sub-systems.

2 Background

In South Asia, the Siyaq system is known as Raqm (Arabic رقم *raqm* ‘account’). Similar to the other Siyaq traditions, the Raqm Numerals are a specialized subset of the Arabic script that was used for accounting and other numerical notation. The basic Raqm Numerals are stylized monograms of the Arabic names for the numbers, but the numerals for large decimal orders are derived not from Arabic, but from Indic languages, and the method of writing fractions and currencies is based on a common north Indic numerical notation system.

While the majority of documents containing Siyaq are hand-written, a rare exception is the appearance of Raqm Numerals in printed books. A work by Francis Gladwin titled *A Compendious System of Bengal Revenue Accounts* (1790) is perhaps the first book to use Siyaq-based numerals in print. In the preface to his book, Gladwin writes “that the following compendium of Siyak Accounts is the first specimen of the sort that has yet appeared in print, the types having been made purposely for it.”¹ A specimen of Raqm printed in Gladwin’s metal fonts is given in Figure 9.

¹Gladwin 1790: vii.

	x1	x10	x100	x1,000	x10,000	x100,000	x1,000,000
1	عص (له)	عه (ع)	ما	الـ	عت	للهكه	عك
2	عصا (ع)	عه (ع)	ماه	عـ	عت	للههان	عك
3	لـ (ب)	له	لما	لـ	لت	للهك	لك
4	لـ (ل)	لله	لما	لـ	لـ	للهك	لك
5	صـ (ب)	صه	صا	صـ	صت	صك	ك
6	هـ (ب)	هه	ها	هـ	هت	هك	ك
7	مهـ (م)	مه	ما	مهـ	مـ	مك	ك
8	كـ (ب)	كه (ب)	كا	كـ	كت	كك	ك
9	لوه (ل)	لوه	لوا	لوهـ	لوت	لوك	ك

Table 1: South Asian forms of the Siyaq numerals for six decimal orders.

3 The Notation System

3.1 Structure

Raqm Numerals represent units of a base-10 (decimal) positional system. The notation system is additive, that is, the value of a number is the sum of the values of the numerals that constitute it. There is no character for zero; it is inherently represented in the distinct numerals for the various decimal orders.
































3.2 Directionality

Raqm Numerals are written right-to-left in the regular manner of the Arabic script, unlike the left-to-right directionality of the Arabic-Indic digits.

3.3 Typology

Raqm Numerals are highly stylized monograms of the Arabic names for numbers for the primary units and their magnitudes in the orders of tens, hundreds, thousands and ten thousands. Raqam Numerals for the hundred thousands and millions are based upon names for numbers derived from Sanskrit.

The numerals may be decomposed to some degree into basic forms and into distinctive signs for the various decimal orders. The exceptions are generally the numerals for magnitudes of one (1, 10, 100, etc.) and two (2, 20, 200, etc.), which have unique forms in all decimal orders. A complete description of the numerals of each decimal order is given in section 4, however, a summary is given below:

- The independent shape of a primary numeral can be decomposed into a character primitive that forms the basis for numerals of all decimal orders for that numeral:  FIVE PRIMITIVE ←  FIVE.
- Each primary numeral has a base form that is used in writing composite numbers. The base form of a primary numeral is produced by joining the primitive form of the primary numeral to a horizontal stroke:  FIVE BASE ←  BASE MARK +  FIVE PRIMITIVE.
- The numerals for the tens consist of the base form of the primary numeral joined to a distinctive terminal:  FIFTY ←  TENS MARKS +  FIVE BASE.
- The numerals for the hundreds consist of the base form of the primary numeral joined to the numeral for 100:  FIVE HUNDRED ←  ONE HUNDRED +  FIVE BASE. Certain numerals for the hundreds use an alternate base form.
- The numerals for the thousands consist of the primitive form of the primary numeral joined to a distinctive terminal:  FIVE THOUSAND ←  THOUSANDS MARK +  FIVE PRIMITIVE. When written independently, the thousands are marked with the placeholder  , eg.  FIVE THOUSAND
- The numerals for the ten thousands consist of a modified (base) form of the tens numerals, which is produced by dropping the  TENS MARKS, and a placeholder when written independently:  FIFTY THOUSAND ←  PLACEHOLDER +  FIFTY BASE. For most tens numeral, the base is identical to the base form of the primary numeral, but different for TEN, TWENTY, and EIGHTY, eg. the base form of EIGHTY is  and the base form of EIGHT is .
- The numerals for the hundred thousands are written using the independent form of the primary numeral and a mark that represents the hundred thousands unit:  FIVE HUNDRED THOUSAND ←  HUNDRED THOUSANDS MARK +  FIVE
- The numerals for the millions are written using a modified (base) form of the tens (similar to the ten thousands) and the mark that represents the hundred thousands unit:  FIVE MILLION ←  HUNDRED THOUSANDS MARK +  FIFTY BASE
- The numerals for the ten millions are written using the independent form of the primary numeral and a mark that represents the ten millions unit:  FIFTY MILLION ←  TEN MILLION +  FIVE

3.4 Ordering

The ordering of Raqm Numerals is visual, which reflects the method of expressing numbers in Arabic. The ordering of Raqm Numerals based upon non-Arabic sources is also visual, which reflects the method of expressing numbers in Urdu.

3.5 Orthography

Raqm Numerals are written according to the rules for expressing numbers in Arabic. The largest numeral of a number is written first, except in composite numbers.

The writing of composite numbers (primary numeral + larger numeral) is governed by the following rules:

1. The base form of the primary numeral is used in composite numbers of the same decimal order. The numerals are written transposed, with the primary numeral positioned before the larger numeral. This rule governs the writing of numbers such as 10, 11, ..., 10,000, 11,000, ..., etc.

- The independent form of the primary numeral is used in composite numbers of different decimal orders. The numerals are written in the regular order with the larger numeral preceding the primary numeral. This rule governs the writing of numbers such as 101, 102, ..., 1,001, 1,002, ..., 1,100, 1,200, ..., etc.

4 The Numerals

4.1 The Primary Unit

The primary unit consists of numerals for the numbers 1 through 9. The numerals are stylized monograms of the Arabic names for the numbers or abbreviations of the names consisting of the initial and one or more letters. The glyphs for Raqm ONE and TWO have origins different from those of the numerals in other Siyaq sub-systems, where the numeral ONE is derived from احد *ahad* ‘one’ and TWO from اثنان *itnān* ‘two’. The Raqm numeral ONE is based upon Arabic عدد *dad* ‘number’ and TWO is based upon عددن *dadān* ‘dual’.

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
عد	ع + د + ه	عدد	<i>dad</i> one
عدا	ع + د + ن	عدان	<i>dadān</i> two
لث	ث + ل + ع	ثلاثة	<i>talāṭa</i> three
لر	ا + ر + ع	اربعة	<i>arba‘a</i> four
صم	خ + م	خمسة	<i>hamsa</i> five
س	س + ع	ستة	<i>sitta</i> six
مع	س + ع + ه	سبعة	<i>sab‘a</i> seven
سك	س + ا + ع	ثمانية	<i>tamāniya</i> eight
لث	ت + ع	تسعة	<i>tis‘a</i> nine

4.1.1 Variant Forms

The following characters have variant forms:

- The numeral عد ONE is also written as ع.
- The numeral عدا TWO is also written as عا and عدا.

4.1.2 Base Forms of the Primary Numerals

When written in composite numbers, the primary numbers are written differently, in what might be called their base form. These base forms are derived from the most primitive element of the numeral. This character primitive is joined to a horizontal swash (comparable to U+0640 ARABIC TATWEEL) to create the base form. The character primitive is used in the numerals for the hundreds and thousands, with some exceptions as described in the sections for those units.

	1	2	3	4	5	6	7	8	9
INDEPENDENT	عص	عصا	عصا	للم	صم	صم	مع	عصا	لوم
PRIMITIVE	له	ع	ه	للو	م	م	مو	ه	لو
BASE	له	ع	ب	للو	م	م	مو	ه	لو

4.2 The Tens Unit

The numerals for the tens unit are composed from the base forms of the primary numerals joined to the tens terminal, which is a stylized form of the ن NOON in the Arabic suffix for the tens (ون *ūn*), which is represented as a loop: ٥. The exceptions are TEN and TWENTY, which have base forms that are used in writing the tens, ten thousands, and millions units. The base form of TEN is ع and that of TWENTY is عه. The base form of TEN ع is similar to the base form of TWO (ع), which may be distinguished through context.

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
ع	ع + ٥	عشرة	<i>ašara</i> ten
عه	ع + عه	عشرون	<i>‘iṣrūn</i> twenty
ه	ه + ب	ثلاثون	<i>ṭalāṭūn</i> thirty
له	ه + للو	اربعون	<i>arba‘ūn</i> forty
مه	ه + م	خمسون	<i>ḥamsūn</i> fifty
ه	ه + م	ستون	<i>sittūn</i> sixty
مه	ه + مع	سبعون	<i>sab‘ūn</i> seventy
له	ه + ل	ثمانون	<i>ṭamānūn</i> eighty
له	ه + لو	تسعون	<i>tis‘ūn</i> ninty

4.2.1 Base Forms of the Tens Numerals

The tens numerals have base forms that are used in the writing of numbers of the ten thousands and millions units. The base form of a tens numeral is derived by dropping the stylized NOON that marks the tens terminal ٥. Except for TEN, TWENTY, and EIGHTY, the base forms of the tens are identical to the base form for the corresponding primary unit.

	10	20	30	40	50	60	70	80	90
INDEPENDENT	ع	ع	ه	ل	م	ه	م	ه	ه
BASE	ع	ع	ه	ل	م	ه	م	ه	ه

4.3 The Hundreds Unit

The numerals for the hundreds are derived from the primitive forms of the primary numerals joined to the mark م, which is the abbreviation of the Arabic word مائة ‘hundred’ as ما. However, not all primitive forms of the primary numerals used in writing the hundreds are identical to those described in section 4.1.2. The primitives used in writing the numerals for FOUR HUNDRED, SIX HUNDRED, SEVEN HUNDRED, and EIGHT HUNDRED represent a different mutation of the primary numerals. These mutations are described below. Apart of these, the other exceptions are the numerals ONE HUNDRED and TWO HUNDRED, which are monograms of the Arabic names for these numbers.

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
ما	—	مائة <i>mi`a</i>	one hundred
مائ	—	مائتان <i>mi`ātān</i>	two hundred
مئ	ما + ه	ثلاث مائة <i>ṭalāṭu mi`a</i>	three hundred
مئ	ما + ه	اربع مائة <i>arba`u mi`a</i>	four hundred
مئ	ما + ه	خمس مائة <i>ḥamsu mi`a</i>	five hundred
مئ	ما + ه	ست مائة <i>sittu mi`a</i>	six hundred
مئ	ما + ه	سبع مائة <i>sab`u mi`a</i>	seven hundred
مئ	ما + ه	ثمان مائة <i>ṭamānu mi`a</i>	eight hundred
مئ	ما + ه	تسع مائة <i>tis`u mi`a</i>	nine hundred

The following numerals take forms different from the base shape when used to form the hundred numeral

	HUNDREDS	PRIMITIVE	INDEPENDENT
400	مئ	ه	ل
600	مئ	ه	ع
700	مئ	ه	م
800	مئ	ه	ل

4.4 The Thousands Unit

The numerals for the thousands are composed from the primitive forms of the primary numerals joined to the terminal **ا**, which is an abbreviation of the Arabic word الف ‘thousand’. When written independently, the thousands are marked as **آ**, where the element **آ** represents the absence of other numbers.

It may appear that the thousands are written using the base form of the primary numeral + the element **آ**, but this is not the case. Only the TWO THOUSAND follows this pattern: cf. base form of TWO **ا** and TWO THOUSAND **آ**. However, this is on account of the special forms for TWO in each decimal order. Compare base form of SIX **ا** and SIX THOUSAND **آ**.

The forms for ONE THOUSAND and TWO THOUSAND have special forms. The ONE THOUSAND is a monogram **آ** of Arabic word الف ‘thousand’; the **آ** TWO THOUSAND is based upon the primitive form of TWO (**ا**).

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
آ	—	الف <i>alf</i>	one thousand
آ	—	الفان <i>alfān</i>	two thousand
آ	آ + ه	ثلاثة الاف <i>talāṭa ālāf</i>	three thousand
آ	آ + ل	اربعة الاف <i>arba‘a ālāf</i>	four thousand
آ	آ + م	خمسة الاف <i>ḥamsa ālāf</i>	five thousand
آ	آ + س	ستة الاف <i>sitta ālāf</i>	six thousand
آ	آ + م	سبعة الاف <i>sab‘a ālāf</i>	seven thousand
آ	آ + م	ثمانية الاف <i>tamāniya ālāf</i>	eight thousand
آ	آ + ل	تسعة الاف <i>tis‘a ālāf</i>	nine thousand

4.4.1 Variant Forms

The following characters have variant forms:

- The numeral **آ** ONE THOUSAND also takes the shape **آ**.
- The numeral **آ** TWO THOUSAND also takes the shape **آ**.

4.5 The Ten Thousands Unit

The ten thousands are written using modified forms of the tens numerals, in which the stylized NOON that marks the tens terminal **ه** is dropped. The base forms used in writing the ten thousands unit are derived from modified forms of the tens and are not the base forms of the primary numerals. This assertion is supported by the original Arabic names for these numbers, eg. 80,000 is **آ** *tamānūn alfan* ‘eighty thousands’. Furthermore, the base forms of TEN, TWENTY, and EIGHTY are used in writing these numerals, eg. 80,000 **آ** and not **آ**. When written independently, the ten thousands are marked with **آ**, which is a placeholder mark that represents the absence of other numbers.

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
عٲ	ع + ٲ	عشرة الاف	'ašara ālāf ten thousand
عٲٲ	عٲ + ع	عشرون الفا	'iṣrūn alfan twenty thousand
عٲٲٲ	عٲ + ٲٲ	ثلاثون الفا	talātūn alfan thirty thousand
عٲٲٲٲ	عٲ + ٲٲٲ	اربعون الفا	arba 'ūn alfan forty thousand
عٲٲٲٲٲ	عٲ + ٲٲٲٲ	خمسون الفا	ḥamsūn alfan fifty thousand
عٲٲٲٲٲٲ	عٲ + ٲٲٲٲٲ	ستون الفا	sittūn alfan sixty thousand
عٲٲٲٲٲٲٲ	عٲ + ٲٲٲٲٲٲ	سبعون الفا	sab 'ūn alfan seventy thousand
عٲٲٲٲٲٲٲٲ	عٲ + ٲٲٲٲٲٲٲ	ثمانون الفا	tamānūn alfan eighty thousand
عٲٲٲٲٲٲٲٲٲ	عٲ + ٲٲٲٲٲٲٲٲ	تسعون الفا	tis 'ūn alfan ninty thousand

4.5.1 Variant Forms

The following characters have variant forms:

- The numeral عٲ TEN THOUSAND also takes the shape عٲٲ, which is based upon the typology of the thousands. It is derived from the word-initial AIN of عشرة 'ašara 'ten' + ٲ the thousands base. In some Siyaq sub-systems, TEN is grouped with the primary units and, therefore, its numerals of the various decimal orders are based upon the typology for that group.

4.6 The Hundred Thousands Unit

The numerals for the hundred thousands unit are written as the regular form of the primary unit + كك HUNDRED THOUSANDS MARK. This method of representing this decimal order in the Raqm tradition differs from the other Siyaq sub-systems in that it borrows from a non-Arabic tradition. The monogram كك is derived from the Hindi लाख 'hundred thousand'. In modern Indian notation, the *lākh* is written as 1,00,000.

This is different from the Arabic model, where 'hundred thousand' is expressed as الف مائة *mi'a alf* and various magnitudes of the unit are expressed by prefixing the primary numeral to the unit, eg. 'five hundred thousand' خمس مائة الف *ḥamsu mi'a alf*.

The Raqm tradition reflects the typology of the Siyaq system in that it has special forms for ONE HUNDRED THOUSAND and TWO HUNDRED THOUSAND; these are written as ككٲ and ككٲٲ, respectively.

RAQM	COMPOSITION	URDU SOURCE	ENGLISH
لکھ	—	ایک لاکھ	<i>ēk lākh</i> one hundred thousand
لکھان	—	دو لاکھ	<i>dō lākh</i> two hundred thousand
سے لک	تے + لک	تین لاکھ	<i>tīn lākh</i> three hundred thousand
دو لک	تھ + لک	چار لاکھ	<i>chār lākh</i> four hundred thousand
پانچ لک	پم + لک	پانچ لاکھ	<i>pānch lākh</i> five hundred thousand
چھ لک	سے + لک	چھ لاکھ	<i>chah lākh</i> six hundred thousand
سات لک	سہ + لک	سات لاکھ	<i>sāt lākh</i> seven hundred thousand
آٹھ لک	اٹھ + لک	آٹھ لاکھ	<i>āṭh lākh</i> eight hundred thousand
نو لک	نہ + لک	نو لاکھ	<i>nō lākh</i> nine hundred thousand

The writing of the hundred thousands unit reflects the expression of numbers of the group. The number 300,000 is expressed as *تین لاکھ*, and is, therefore, written as *سے لک* (THREE + HUNDRED THOUSANDS MARK), not as **یک* (THREE BASE + HUNDRED THOUSANDS MARK).

4.7 The Millions Unit

The numerals for the millions unit are written with the base form of the tens and *لک* HUNDRED THOUSANDS MARK. The millions are an extension of the hundred thousands unit and are expressed as ‘tens of hundred-thousands’, eg. five million is ‘fifty hundred-thousands’. This system is unrelated to the Arabic model, where the millions unit, in the Ottoman Siyaq tradition, is expressed as ‘thousand times a thousand’, eg. five million *خمسة الاف مرة الف* *hamsu ālāf maratan alf* ‘five-thousand times a thousand’. In modern Indian notation, the millions are expressed as ‘ten *lākh*’ and written as 10,00,000.

RAQM	COMPOSITION	URDU SOURCE	ENGLISH
دس لاکھ	ع + لک	دس لاکھ	<i>das lākh</i> one million
بیس لاکھ	ع + لک	بیس لاکھ	<i>bīs lākh</i> two million
تیس لاکھ	س + لک	تیس لاکھ	<i>tīs lākh</i> three million
چالیس لاکھ	ل + لک	چالیس لاکھ	<i>chālis lākh</i> four million
پچاس لاکھ	م + لک	پچاس لاکھ	<i>pachās lākh</i> five million
ساٹھ لاکھ	س + لک	ساٹھ لاکھ	<i>sāṭh lākh</i> six million
ستر لاکھ	م + لک	ستر لاکھ	<i>sattar lākh</i> seven million
اسی لاکھ	ب + لک	اسی لاکھ	<i>asī lākh</i> eight million
نہے لاکھ	ع + لک	نہے لاکھ	<i>nabbē lākh</i> nine million

4.8 The Ten Millions Unit

The numbers for the ten millions are an extension of the millions — ‘hundreds of hundred-thousands’ or ‘one-hundred *lākh*’. In modern Indian notation, the tens millions are expressed as *karor* (‘hundred *lākh*’) and written as 1,00,00,000.

The numeral TEN MILLION is *کرور*, which is derived from *کرور* *karor* (Hindi करोड़ *karor* < Sanskrit कोटि *koṭi*). The numeral TWENTY MILLION is written *کروران* *karorān*, which is expressed as a plural of *کرور* that adds the Persian plural marker آن *ān* to *کرور*. This illustrates an attempt to pattern non-Arabic number names on an Arabic pattern, similar to the method in which 10 and 20 are expressed in Arabic as *عشرة* *ašara* and *عشرون* *išrūn*.

RAQM	COMPOSITION	URDU SOURCE	ENGLISH
کرور	—	کرور	<i>karōr</i> ten million
کروران	—	کروران	<i>karōrān</i> twenty million

The numbers 30–90 million are written using the primary numeral + the numeral *کرور* TEN MILLION, eg. 50 million is ‘five *karor*’ and is written *پنہ کرور*.

Hypothetically, the method of representing 100 millions would be patterned upon the typology for the ten millions. The number 500 million would be rendered as ‘fifty *karor*’ and written as *پنہ کرور*.

4.9 Composite Numbers

Composite numbers of the primary and tens units are written using the base form of the primary numeral and the appropriate tens numeral. The numbers 10–19 are illustrated below. In some Siyaq sub-systems, such

as Diwani, the numbers 10–19 are written using a base form of TEN. Although the Raqam system has a base form of TEN, all composite numbers are written using the regular forms of the tens numerals.

RAQM	COMPOSITION	ARABIC SOURCE	ENGLISH
ع	—	عشرة	'ašara ten
دع	ع + د	احد عشر	aḥad 'ašara eleven
دع	ع + ب	اثنا عشر	iṭnā 'ašara twelve
دع	ع + س	ثلاثة عشر	talāṭa 'ašara thirteen
دوع	ع + ل	اربعة عشر	arba'a 'ašara fourteen
دوع	ع + م	خمسة عشر	ḥamsa 'ašara fifteen
دع	ع + ن	ستة عشر	sitta 'ašara sixteen
دوع	ع + و	سبعة عشر	sab'a 'ašara seventeen
دع	ع + ز	ثمانية عشر	tamāniya 'ašara eighteen
دوع	ع + ح	تسعة عشر	tis'a 'ašara nineteen

As the table above illustrates, the base form of the primary numeral is positioned in a particular fashion with the larger numeral. If the base form of the primary numeral has no vertical element on the right edge, it is written beneath the larger numeral: $دع$ 16 ← $ع$ TEN + $د$ SIX BASE. If a vertical element is present, the swash of the primary numeral subtends beneath the numeral: $دوع$ 19 ← $ع$ TEN + $ل$ NINE BASE.

When the thousands and ten thousands are written with numerals from smaller decimal orders, the placeholder $ٲ$ is dropped and the numerals are stacked: ٥٥٠٠ 5,500 ← ٥٠٠ FIVE HUNDRED + ٥٠٠٠ FIVE THOUSAND; ٥٥٠٠٠ 50,500 ← ٥٠٠ FIVE HUNDRED + ٥٠٠٠٠ FIFTY THOUSAND.

4.10 Fractions

There are three signs for representing fractions in the Raqam system.

RAQM	ENGLISH
ـ	$\frac{1}{4}$ one quarter
•	$\frac{1}{2}$ one half
ن	$\frac{3}{4}$ three quarters

4.11 Placeholder Mark

As described in sections 4.4 and 4.5, the thousands and ten thousands are written when the placeholder mark $ٲ$ when they appear alone. This mark is also written as $ٲٲ$ and $ٲٲٲ$. This mark represents the absence of numbers and is written above the horizontal stroke of numerals: $ٲٲٲٲ$ ← $ٲٲٲٲ$.

4.12 Currency Sign

The character / is used to write currencies. It represents the rupee currency unit. There is a special orthography for writing currencies in Raqm, which is based on the rupee system that was common across northern South Asia (see Pandey 2007a for a description). This currency system is based upon the rupee (*rupayā*), *ānā*, and *pāī*; with regional variants such as that used in Bengali, which uses the unit *gaṇḍā* instead of *pāī*, as shown in Figure 7 (see Pandey 2007b for a description).

When a Raqm numeral is written with the currency mark, it represents rupees: ‘fifty rupees’ / ٥٠. When an Arabic-Indic digit is written with a currency mark, it represents values of the *ānā* unit: ‘five *ānā*’ / ٥. When a fraction sign is written with the currency mark, the combination represents a fraction of the *ānā* unit, which is called the *pāī* unit: ‘¼ *ānā*’ or ‘one *pāī*’ / ١⁄٤.

5 Implementation

5.1 Encoding Model

Given the above analysis, there are three possible model for encoding the Raqm Numerals.

1. Encode each numeral as an atomic character
2. Encode the numerals using character primitives
3. Encode a combination of numerals and unit marks

1. Encode each numeral as an atomic character The most elementary approach to encoding the Raqm Numerals is to encode each individual numeral as an atomic character. This model would require 85 characters for the numerals: primary units (9), base forms of the primary units (9), tens (9), hundreds (9), thousands (9), ten thousands (9), hundred thousands (9), and millions (9), and ten millions (9); and fractions (3) and currency mark (1).





The advantage of this model is that no special rendering rules are needed to write the numerals. Units larger than millions may be written using combinations of other characters.

The disadvantage is the encoding of redundant characters, in particular the hundred thousands, millions, and ten millions units, which may be written using characters for other units.

2. Encode the numerals using character primitives While the typological characteristics of the Diwani Numerals makes it theoretically possible to encode that Siyaq sub-system using character primitives, this model does not provide an effective means for encoding the Raqm Numerals. In this approach, the Raqm Numerals would be represented using the primitive forms of the primary numerals and the distinctive sign for each decimal order, as is a possibility for Diwani Numerals. However, while there are distinctive signs for tens and other units, there is no such sign for the primary units in Raqm.

To encode Raqm numerals using character primitives, a *PRIMARY UNITS MARK would have to be invented. Raqm ONE ١ would then be produced by writing *PRIMARY UNITS MARK + ١ ONE BASE, requiring the rendering engine to produce the correct glyph from the backstore from a given a sequence of characters.

The major disadvantage to this approach is the heavy reliance upon rendering rules. The shaping engine would need to produce the appropriate forms for special ligatures. The number one thousand ١٠٠٠ would be produced by ١ THOUSANDS SIGN + ١ ONE BASE.

As the thousands and ten thousands are not distinguished through terminal marks, but by the base shape of the numeral, producing numerals for ten thousands would be expensive in a character-primitives model. The independent form of ten thousand  would be produced through the use of multiple terminal marks: " PLACEHOLDER MARK +  THOUSANDS MARK +  TENS MARK +  BASE ONE;

Another disadvantage is ordering. With this approach the rendering engine would need to first compose the appropriate number for a base numeral + a unit sign, then order these pairs according to the Arabic counting order.

Although the primitives approach reflects the pattern that underlies the typology of the Raqm Numerals, the complexity of this encoding model will restrict its implementation.

3. Encode a combination of numerals and unit marks A third approach is a mean between the two discussed previously. In this model the numerals of the primary, tens, hundreds, thousands, and ten thousands units are encoded as atomic characters. Based upon their glyphic representation, the various numerals for the hundred thousands and millions may be written using sequences of other characters, eg. the numerals for the hundred thousands unit may be written using the primary unit + ONE HUNDRED THOUSANDS MARK. This model also encodes numerals of various decimal orders, which may be considered typologically unique.

This model would require 64 characters:

- The primary numerals and their combining forms (18)
- The tens (9)
- The hundreds (9)
- The thousands (9)
- The ten thousands (9)
- ONE HUNDRED THOUSAND, TWO HUNDRED THOUSAND, and HUNDRED THOUSANDS MARK (3)
- ONE MILLION and TWO MILLION (2)
- Fraction signs (3)
- Currency marks (1)
- Placeholder mark (1)

Of the three, this approach offers the least complicated method of encoding Raqm Numerals.

5.2 A Basic Character Set for Raqm Numerals

Based upon encoding model #3, 64 characters are required to encode Raqm Numerals in the UCS:

```

xx01 RAQM NUMERAL ONE
xx02 RAQM NUMERAL TWO
xx03 RAQM NUMERAL THREE
xx04 RAQM NUMERAL FOUR
xx05 RAQM NUMERAL FIVE
xx06 RAQM NUMERAL SIX
xx07 RAQM NUMERAL SEVEN
xx08 RAQM NUMERAL EIGHT
xx09 RAQM NUMERAL NINE

xx0A RAQM NUMERAL TEN
xx0B RAQM NUMERAL TWENTY
xx0C RAQM NUMERAL THIRTY
xx0D RAQM NUMERAL FORTY
xx0E RAQM NUMERAL FIFTY
xx0F RAQM NUMERAL SIXTY
xx10 RAQM NUMERAL SEVENTY
xx11 RAQM NUMERAL EIGHTY
xx12 RAQM NUMERAL NINETY

```

xx13 RAQM NUMERAL ONE HUNDRED
 xx14 RAQM NUMERAL TWO HUNDRED
 xx15 RAQM NUMERAL THREE HUNDRED
 xx16 RAQM NUMERAL FOUR HUNDRED
 xx17 RAQM NUMERAL FIVE HUNDRED
 XX18 RAQM NUMERAL SIX HUNDRED
 XX19 RAQM NUMERAL SEVEN HUNDRED
 xx1A RAQM NUMERAL EIGHT HUNDRED
 xx1B RAQM NUMERAL NINE HUNDRED

 xx1C RAQM NUMERAL ONE THOUSAND
 xx1D RAQM NUMERAL TWO THOUSAND
 xx1E RAQM NUMERAL THREE THOUSAND
 xx1F RAQM NUMERAL FOUR THOUSAND
 xx20 RAQM NUMERAL FIVE THOUSAND
 xx21 RAQM NUMERAL SIX THOUSAND
 xx22 RAQM NUMERAL SEVEN THOUSAND
 xx23 RAQM NUMERAL EIGHT THOUSAND
 xx24 RAQM NUMERAL NINE THOUSAND

 xx25 RAQM NUMERAL TEN THOUSAND
 xx26 RAQM NUMERAL TWENTY THOUSAND
 xx27 RAQM NUMERAL THIRTY THOUSAND
 xx28 RAQM NUMERAL FORTY THOUSAND
 xx29 RAQM NUMERAL FIFTY THOUSAND
 xx2A RAQM NUMERAL SIXTY THOUSAND
 xx2B RAQM NUMERAL SEVENTY THOUSAND
 xx2C RAQM NUMERAL EIGHTY THOUSAND
 xx2D RAQM NUMERAL NINETY THOUSAND

 xx2E RAQM NUMERAL ONE HUNDRED THOUSAND
 xx2F RAQM NUMERAL TWO HUNDRED THOUSAND

 xx31 RAQM NUMERAL TEN MILLION
 xx32 RAQM NUMERAL TWENTY MILLION

 xx33 RAQM NUMERAL COMBINING ONE
 xx34 RAQM NUMERAL COMBINING TWO
 xx35 RAQM NUMERAL COMBINING THREE
 xx36 RAQM NUMERAL COMBINING FOUR
 xx37 RAQM NUMERAL COMBINING FIVE
 xx38 RAQM NUMERAL COMBINING SIX
 xx39 RAQM NUMERAL COMBINING SEVEN
 xx3A RAQM NUMERAL COMBINING EIGHT
 xx3B RAQM NUMERAL COMBINING NINE

 xx3C RAQM FRACTION ONE QUARTER
 xx3D RAQM FRACTION ONE HALF
 xx3E RAQM FRACTION THREE QUARTERS

 xx3F RAQM CURRENCY MARK RUPEE

 xx40 RAQM HUNDRED THOUSANDS MARK
 xx41 RAQM PLACEHOLDER MARK

6 References

- Ahmad Dihlavī, Sayyid. 1974. *فرہنگ آصفیہ* [*Farhang-i Āsafiyah*]. vol. 2. Delhi: Taraqqī-e-Urdū Board, National Academy.
- Barker, Muhammad Abd-al-Rahman. 1967. *A Course in Urdu*. Vol. 1. Montreal: Institute of Islamic Studies, McGill University.
- Gladwin, Francis. 1790. *A Compendious System of Bengal Revenue Accounts*. In three parts. Part I. Calcutta: Manuel Cantopher.
- Naim, Chaudhry M. 1999. *Introductory Urdu*. 3rd ed. rev. Chicago: South Asia Language & Area Center, University of Chicago.

- Muhazzab, Muhammad Mirza. 195-?. *محرّب اللغت* [*Muhazzab al-Lughat*]. Lakhnau, Muhafiz Urdu Book Depot.
- Muqtadirah Qaumi Zaban. 2001. *درسی اردو لغت* [*Darsi Urdu Lughat*]. Taba‘ 1. Silsilah-yi matbu‘at-yi Muqtadirah-yi Qaumi Zaban; 391. Islamabad.
- Pandey, Anshuman. 2007a. “Proposal to Encode North Indic Number Forms in ISO/IEC 10646.” ISO/IEC JTC1/SC2/WG2 N3367 L2/07-354. October 7, 2007. <http://std.dkuug.dk/jtc1/sc2/wg2/docs/n3367.pdf>
- . 2007b. “Proposal to Encode the Ganda Currency Mark for Bengali in ISO/IEC 10646.” ISO/IEC JTC1/SC2/WG2 N3311R L2/07-192R. October 8, 2007. <http://std.dkuug.dk/jtc1/sc2/wg2/docs/n3311.pdf>
- Platts, John T. 1909. *A Grammar of the Hindūstānī or Urdū Language*. 5th imp. London: C. Lockwood.
- Stewart, Charles. 1825. *Original Persian Letters and Other Documents with Fac-Similes*. London: printed for the author by W. Nicol.

Table of Raqam.

رقم	تعداد	رقم	تعداد	رقم	تعداد	رقم	تعداد	رقم	تعداد	رقم	تعداد
١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠	١٠٠
٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠	٩٠
٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠	٨٠
٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠	٧٠
٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠	٦٠
٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠	٥٠
٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠	٤٠
٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠	٣٠
٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠	٢٠
١٠	١٠	١٠	١٠	١٠	١٠	١٠	١٠	١٠	١٠	١٠	١٠
٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠

\diagup = $\frac{1}{4}$ of an ānā; \diagdown = $\frac{1}{2}$ an ānā; \diagup = $\frac{3}{4}$ of an ānā; \diagdown = one ānā

Rs. As. Tāṭī
 \diagup = 125, 11, 8 $\frac{3}{4}$, \diagdown = 795, 11 $\frac{3}{4}$

Figure 1: Table showing Siyaq forms as used in South Asia (from Platts 1909: 60). It should be noted that the translated values of the Raqam examples are wrong. The value 795 Rs and 11 3/4 As as represented in Raqam is actually 295 Rs and 1 3/4 As. Platts represents \diagup as 1/2 ānā in the table, but assesses it as 3/4 ānā in the examples.

SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
۳	-/-/3	۹	-/-/9	۱۳	-/1/3
۶	-/-/6	۱۱	-/1/-	۱۶	-/1/6
SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
۹	-/1/9	۱۲	12/-/-	۷۰	70/-/-
۱۲	-/2/-	۱۳	13/-/-	۸۰	80/-/-
۱۳	1/-/-	۱۴	14/-/-	۹۰	90/-/-
۱۶	2/-/-	۱۵	15/-/-	۱۰۰	100/-
۱۹	3/-/-	۱۶	16/-/-	۲۰۰	200/-
۲۰	4/-/-	۱۷	17/-/-	۳۰۰	300/-
۳۰	5/-/-	۱۸	18/-/-	۴۰۰	400/-
۳۱	6/-/-	۱۹	19/-/-	۵۰۰	500/-
۳۲	7/-/-	۲۰	20/-/-	۶۰۰	600/-
۳۳	8/-/-	۳۰	30/-/-	۷۰۰	700/-
۳۹	9/-/-	۴۰	40/-/-	۸۰۰	800/-
۴۰	10/-/-	۵۰	50/-/-	۹۰۰	900/-
۴۱	11/-/-	۶۰	60/-/-	۱,۰۰۰	1,000/-
				لاکھ	lakh/-

Figure 2: Table showing Siyaq forms as used in South Asia (from Barker 1967: 356–357).

8.6. Sums: Both India and Pakistan now have a decimal coinage system, a rupee being divided into one hundred paises. In Urdu, the decimal point is written as: ٫

Examples:

$$۱۵۰ = \text{Re. } 1.00 \quad ۵۰ = 50 \text{ p.} \quad ۵۰۵ = 5 \text{ p.} \quad ۱۵۱۴ = \text{Rs. } 1.14$$

8.7. Before the currency was reformed in the two countries, a rupee was divided into sixteen annas or sixty-four pice (paisa). There was then also a different system, besides the numerals, for writing sums.

۱ = R. 1/-	۲ = Rs. 2/-	۳ = Rs. 3/-
۴ = Rs. 4/-	۵ = Rs. 5/-	۶ = Rs. 6/-
۷ = Rs. 7/-	۸ = Rs. 8/-	۹ = Rs. 9/-
۱۰ = Rs. 10/-	۱۱ = Rs. 11/-	۱۲ = Rs. 12/-
۱۳ = Rs. 13/-	۱۴ = Rs. 14/-	۱۵ = Rs. 15/-
۱۶ = Rs. 16/-	۱۷ = Rs. 17/-	۱۸ = Rs. 18/-
۱۹ = Rs. 19/-	۲۰ = Rs. 20/-	۳۰ = Rs. 30/-
۴۰ = Rs. 40/-	۵۰ = Rs. 50/-	۶۰ = Rs. 60/-
۷۰ = Rs. 70/-	۸۰ = Rs. 80/-	۹۰ = Rs. 90/-
۱۰۰ = Rs. 100/-	۱/۴ = 1/4 anna or 1 pice	
۱/۲ = 1/2 anna or 2 pice	۳/۴ = 3/4 anna or 3 pice	۱ = 1 anna
۱ 1/۴ annas	۱ 1/۲ annas	۲ = 2 annas
۳ = Rs. 3 and 2 annas & 3 pice		

Figure 3: Table showing Siyaq forms as used in South Asia (from Naim 1999: 49–50).

لفظ جس کا اختصار کیا گیا	جو صورت قرار دی گئی
عدد	عہ
عَدَدَان	عہا
ثَلَاثَة	ے
أَرْبَعَة	للعہ
خَمْسَة	صہ
سِتَّة	کے
سَبْعَة	مہ
ثَمَانِيَة	تہ
تِسْعَة	لہ
عَشْرَة	عہ

Figure 4: The Arabic sources of the Urdu Siyaq forms (from Muhazzab 195-?: 51).

رقوم (ر + قو + م)	[اسم - مونث - جمع]
-	رقمیں - ہندسے اور اعداد کی شکلیں، مثلاً -
-	(اردو) ۱، ۲، ۳، ۴، ۵، ۶، ۷، ۸، ۹، ۱۰ -
-	(انگریزی) 1-2-3-4-5-6-7-8-9-10 -
-	عہ - عہ - ے - للوہ - صہ - ے - موہ - میہ - لوہ - عہ -
-	عہ -
-	(رومن) i - ii - iii - iv - v - vi - vii - viii - ix - x -
-	واحد: رقم -

Figure 5: Table showing Siyaq forms as used in South Asia (from Muqtadirah Qaumi Zaban 2001: 718).

رقم - ج. اسم مؤنث (۱) خط - نوشتہ - تحریر (۲) نقش - مہر نشان - چھاپ -
 چھاپا (۳) - ۱) سندسہ - عدد - روپوں کے وہ نشان یا سندسہ سے جو ایک
 خاص صورت میں الفاظ کا اختصار کر کے بنائے گئے ہیں جیسے عدد
 کی صورت میں عددوں کا مختصر لکھا جاتا ہے۔ ۱) رجبہ لکھو - چھہ چھہ چھہ لکھو
 سبہ شہہ ثنائیدہ شہہ رشتہ شہہ شہہ شہہ شہہ وغیرہ + بیگہ بیگہ وغیرہ
 کے سندسہ جو قریب قریب روپوں کے سندسوں کے مطابق ہیں
 (۲) - ۱) ٹوم - زیور - گھنا پاتا (۵-۱) سونے کی چڑیا - مالدار آدمی
 دو لقمند (۶-۱) اعجاز - عجیب آدمی چلتا ہوا پرزہ چالاک - ہوشیا
 (۷-۱) نوجی - کم سن کسی (۸-۱) جنس - بھانت - رقم + ڈھنگ - طو
 طریق (۹-۱) پٹی - تشخیص کی شرح - شرح لگان (۱۰-۱) جو اسہرات
 جواہر (۱۱-۱) مال و دولت - جو کھوں - قیمتی چیز +
 ایکے دل آپ جگر چھوڑ گئے سینے میں + ایک تم یا دہی ایک تم بھول گئے (دلغ)
 تین نازہونیکہ نیکہ کر لیا بیٹے کا دل + یہ رقم نہ ماخذ لگتی نہ یہ افتخار ہوتا

Figure 6: Table showing Siyaq forms as used in South Asia (from Dihlavi 1974: 363).

TABLE OF FIGURES. 5

Cowrit.	Gundabs.	Gundabs.	Annas.
$\frac{1}{4}$ — 1	16/	1/	1/ 1
$\frac{1}{2}$ • 2	17/	2/	2/ 2
$\frac{3}{4}$ — 3	18/	3/	3/ 3
	19/	4/	4/ 4
		5/	5/ 5
		6/	6/ 6
		7/	7/ 7
		8/	8/ 8
		9/	9/ 9
		10/	10/ 10
		11/	11/ 11
		12/	12/ 12
		13/	13/ 13
		14/	14/ 14
		15/	15/ 15

Observe, that Annas are distinguished from Gundabs by the stroke being placed to the left of the former, and on the right side of the latter.

Figure 7: Table showing method of writing fractions in South Asian tradition (from Gladwin 1790: 5)

بھواللھ

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13
38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73
98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83
3,000	2,000	1,000	900	800	700	600	500	400	300	200	100	30,000	20,000	10,000	9,000
40,000	30,000	20,000	10,000	9,000	8,000	7,000	6,000	5,000	4,000	30,000	20,000	10,000	9,000	8,000	7,000
500,000	400,000	300,000	200,000	100,000	90,000	80,000	70,000	60,000	50,000	400,000	300,000	200,000	100,000	90,000	80,000
5,000,000	4,000,000	3,000,000	2,000,000	1,000,000	900,000	800,000	700,000	600,000	500,000	4,000,000	3,000,000	2,000,000	1,000,000	900,000	800,000
										20,000,000	10,000,000	9,000,000	8,000,000	7,000,000	6,000,000

Figure 8: Table showing Siyaq forms as used in South Asia (from Stewart 1825: Plate 7).

2 TABLE OF FIGURES.

Rekem.	Hind.	Rekem.	Hind.
١	1	٢١	21
٢	2	٢٢	22
٣	3	٢٣	23
٤	4	٢٤	24
٥	5	٢٥	25
٦	6	٢٦	26
٧	7	٢٧	27
٨	8	٢٨	28
٩	9	٢٩	29
١٠	10	٣٠	30
١١	11	٣١	31
١٢	12	٣٢	32
١٣	13	٣٣	33
١٤	14	٣٤	34
١٥	15	٣٥	35
١٦	16	٣٦	36
١٧	17	٣٧	37
١٨	18	٣٨	38
١٩	19	٣٩	39
٢٠	20	٤٠	40

3 TABLE OF FIGURES.

Rekem.	Hind.	Rekem.	Hind.
٤١	41	٤١	41
٤٢	42	٤٢	42
٤٣	43	٤٣	43
٤٤	44	٤٤	44
٤٥	45	٤٥	45
٤٦	46	٤٦	46
٤٧	47	٤٧	47
٤٨	48	٤٨	48
٤٩	49	٤٩	49
٥٠	50	٥٠	50
٥١	51	٥١	51
٥٢	52	٥٢	52
٥٣	53	٥٣	53
٥٤	54	٥٤	54
٥٥	55	٥٥	55
٥٦	56	٥٦	56
٥٧	57	٥٧	57
٥٨	58	٥٨	58
٥٩	59	٥٩	59
٦٠	60	٦٠	60

4 TABLE OF FIGURES.

Rekem.	Hind.	Rekem.	Hind.
٥٠٠	500	٨١	81
٦٠٠	600	٨٢	82
٧٠٠	700	٨٣	83
٨٠٠	800	٨٤	84
٩٠٠	900	٨٥	85
١٠٠٠	1000	٨٦	86
٢٠٠٠	2000	٨٧	87
٣٠٠٠	3000	٨٨	88
٤٠٠٠	4000	٨٩	89
٥٠٠٠	5000	٩٠	90
٦٠٠٠	6000	٩١	91
٧٠٠٠	7000	٩٢	92
٨٠٠٠	8000	٩٣	93
٩٠٠٠	9000	٩٤	94
١٠٠٠٠	10,000	٩٥	95
٢٠٠٠٠	20,000	٩٦	96
٣٠٠٠٠	30,000	٩٧	97
٤٠٠٠٠	40,000	٩٨	98
٥٠٠٠٠	50,000	٩٩	99
٦٠٠٠٠	60,000	١٠٠	100
٧٠٠٠٠	70,000	٢٠٠	200
٨٠٠٠٠	80,000	٣٠٠	300
٩٠٠٠٠	90,000	٤٠٠	400

Figure 9: Table showing printed Siyāq forms as used in South Asia (from Gladwin 1790: 2-4).

The *Rekem*, or *Siyak* characters, being only contractions of *Arabic* words, the following Table may serve to impress them on the memory.

Arabic Words.	Rekem.		Arabic Words.	Rekem.		Rekem.		
						joined.	separate.	
عشر	ع	10	احد عشر	ع	11	ع د	ع د	1
عشرين	ع	20	اثنا عشر	ع	12	ع د و ا ن	ع د و ا ن	2
ثلاثين	ع	30	ثالثه عشر	ع	13	ع د و ا ن ث	ع د و ا ن ث	3
اربعين	ع	40	اربعه عشر	ع	14	ع د و ا ن ر ب ع	ع د و ا ن ر ب ع	4
خمسين	ع	50	خمسه عشر	ع	15	ع د و ا ن خ م	ع د و ا ن خ م	5
ستين	ع	60	سته عشر	ع	16	ع د و ا ن س	ع د و ا ن س	6
سبعين	ع	70	سبعه عشر	ع	17	ع د و ا ن س ب ع	ع د و ا ن س ب ع	7
ثمانين	ع	80	ثمانيه عشر	ع	18	ع د و ا ن ث م ا ن ي ه	ع د و ا ن ث م ا ن ي ه	8
تسعين	ع	90	تسعه عشر	ع	19	ع د و ا ن ت س ع	ع د و ا ن ت س ع	9

N O T E.		Arabic Words.	Rekem.		Arabic Words.	Rekem.	
It is necessary to remark regarding the two first digits, that when combined with tens, <i>ع</i> is a contraction of <i>واحد</i> , and <i>ع</i> of <i>اثنا</i> .		الف	الف	1000	مايه	م	100
		الفان	الفان	2000	مايتان	م	200
		ثالثه آلاف	الفان	3000	ثالثه مايه	م	300
		اربعه آلاف	الفان	4000	اربعه مايه	م	400
		خمسه آلاف	الفان	5000	خمسه مايه	م	500
		سته آلاف	الفان	6000	سته مايه	م	600
		سبعه آلاف	الفان	7000	سبعه مايه	م	700
		ثمانيه آلاف	الفان	8000	ثمانيه مايه	م	800
		تسعه آلاف	الفان	9000	تسعه مايه	م	900

Figure 10: Table showing the Arabic sources of Siyak forms (from Gladwin 1790: 6-7).