Proposal to Encode the Ganda Currency Mark for Bengali in the BMP of the UCS

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1 Introduction

This is a proposal to encode the Bengali ganda mark as part of the Bengali script in the Basic Multilingual Plane (BMP) of the Universal Character Set (UCS) (ISO/IEC 10646). The intention is to provide a sign used for writing the historical gandā (গান্ধারা) currency unit. Several signs used for the writing of currency and other quantities in Bengali are already encoded in the UCS:

\ U+09F2 BENGALI RUPEE MARK
b U+09F3 BENGALI RUPEE SIGN
। U+09F4 BENGALI CURRENCY NUMERATOR ONE
/ U+09F5 BENGALI CURRENCY NUMERATOR TWO
। U+09F6 BENGALI CURRENCY NUMERATOR THREE
।। U+09F7 BENGALI CURRENCY NUMERATOR FOUR
।।। U+09F8 BENGALI CURRENCY NUMERATOR ONE LESS THAN THE DENOMINATOR
।।।। U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN

The encoding of Bengali ganda mark is necessary for accurately and fully reproducing historical numerical notation in the Bengali script and for the representation of the currency mark in digital media.

2 Overview of the Mark

\ BENGALI GANDA MARK

Name The mark is named the Bengali ganda mark. The name describes its function as the unit mark for the gandā currency unit.

Description The Bengali ganda mark belongs to a system of currency notation used in Bengal and other areas of eastern India. The Bengali ganda mark is one of three distinct signs in the Bengali script used for writing the historical currency units rupayā (রুপাই), tākā (টাকা), ānā (অানা), and gandā (গান্ধারা). All three signs appear in written and printed materials. Signs for writing rupayā and and ānā values are already encoded in the UCS. The sign for the rupayā is encoded as \ U+09F2 BENGALI RUPEE MARK and the sign
for the *āna* appears as *U+09F9* BENGALI CURRENCY DENOMINATOR SIXTEEN. The BENGALI GANDA MARK is semantically similar to other currency signs encoded in the UCS, such as the *U+00A2* CENT SIGN, which represent specific currency sub-units. Other systems of currency notation, such as the one used throughout north India, employ a single sign for writing all currency units.¹

**Allocation** It is recommended that the BENGALI GANDA MARK be encoded at the code point *U+09FB*. The placement is appropriate since the preceding code points (*U+09F2–U+09F9*) are currency signs, with the exception of *U+09FA* BENGALI ISSHAR.

**Properties** The BENGALI GANDA MARK belongs to the Unicode general category “Symbol, Currency” (Sc). It is a non-combining sign. Similar to other currency signs, it has a bidirectional value of “European Number Terminator” (ET). Its properties in the Unicode Character Database format are:

```
09FB;BENGALI PAI MARK;Sc;0;ET;;;;;N;;;;;
```

### 3 Bengali Currency Notation

Like other Indian systems, the Bengali currency system is based on the *rupayā*, Anglicized as “rupee.” In Bengal, the *rupayā* is also referred to as *tākā*. Historically, the *rupayā* is comprised of a smaller unit called the *ānā*; there are 16 *ānā* in 1 *rupayā*. The *ānā* consists of a smaller unit called the *ganḍā*; there are 20 *ganḍā* in 1 *ānā*. Each unit has a distinct orthography:

- The *rupayā* is indicated with digits and is marked with *U+09F2* BENGALI RUPEE MARK. The mark is written after the unit: *\"7 rupayā."

- The *ānā* is written with currency numerators. It is marked with *U+09F9* BENGALI CURRENCY DENOMINATOR SIXTEEN, which is written after the unit (see Figure 2):

<table>
<thead>
<tr>
<th>1 <em>ānā</em></th>
<th>2 <em>ānā</em></th>
<th>3 <em>ānā</em></th>
<th>4 <em>ānā</em></th>
<th>5 <em>ānā</em></th>
<th>6 <em>ānā</em></th>
<th>7 <em>ānā</em></th>
<th>8 <em>ānā</em></th>
<th>9 <em>ānā</em></th>
<th>10 <em>ānā</em></th>
<th>11 <em>ānā</em></th>
<th>12 <em>ānā</em></th>
<th>13 <em>ānā</em></th>
<th>14 <em>ānā</em></th>
<th>15 <em>ānā</em></th>
<th>16 <em>ānā</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
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<td>*</td>
</tr>
</tbody>
</table>

- The *ganḍā* is written using digits and is placed after the BENGALI GANDA MARK (see Figure 1):

<table>
<thead>
<tr>
<th>1 <em>ganḍā</em></th>
<th>2 <em>ganḍā</em></th>
<th>3 <em>ganḍā</em></th>
<th>4 <em>ganḍā</em></th>
<th>5 <em>ganḍā</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

The *ganḍā* is divided into an intermediate unit called the *pāi* (পাই). There are 5 *ganḍā* in 1 *pāi*. Thus, *\*t* is equal to 1 *pāi*, *\*o* to 2 *pāi*, etc., resulting in 4 *pāi* in 1 *ānā*. Despite the name, the Bengali *pāi* differs in value from the north Indian *pāi*. The Bengali *pāi* unit is similar to the north Indian *paisā* (পাইসা or *pāisā*), also an intermediate unit; there are 4 *paisā* in 1 *ānā*. The *ganḍā* unit is closer to the north Indian *pāi*; there are 12 *pāi* in 1 *ānā* in the latter system.²

¹See the description of the north Indian currency notation system given in Pandey (2007).
²Halhed, 1778: 176–177.
Historically, there is a unit smaller than the ganḍā called কারী kari. There are 4 kari in 1 ganḍā. The kari is written using Bengali currency numerators four and Bengali currency denominator one less than the denominator. It is marked by the Bengali currency denominator sixteen, which is written before the unit. Thus, 1 kari is \(1/\text{bn_currency16/4} \), 2 kari is \(1/\text{bn_currency16/4/4} \), and 3 kari is \(1/\text{bn_currency16/1less} \).

Only one currency mark is used when multiple units are written. This mark is typically the sign for the smallest unit. When rupayā and ănā values are written together, the Bengali rupee mark is dropped and only Bengali currency denominator sixteen is used: “15 rupayā and 3 ănā” is written as \(15/\text{bn_currency16/3} \), not as \(15/\text{bn_currency16/3/3} \) or as \(15/\text{bn_currency16/3/1less} \). When rupayā, ănā, and ganḍā are written together, only the ganḍā mark is used: “27 rupayā, 6 ănā, and 5 ganḍā” is written as \(27/\text{bn_currency16/6/5} \). When a value contains kari, only Bengali currency denominator sixteen is used: “2 rupayā, 5 ănā, and 3 kari” is written as \(2/\text{bn_currency16/5/3} \).

Comparison to Other Systems  The Bengali notation system differs entirely from the system used in Bihar and Uttar Pradesh. The Bengali system uses currency numerators for writing fraction values, while the north Indian system uses additive fraction signs. Also, while the currency units are written with distinctive signs in Bengali, the rupee mark is used for writing all units in the north Indian system. Thus, “3 rupayā” is \(3\) in Bengali and \(3\) in Devanagari; “15 ănā” is \(15\) in Bengali and \(15\) in Devanagari. The north Indian pāṛ is written using fractions and appears after the currency sign, for example, \(2\) pāṛ”. The equivalent Bengali unit, the ganḍā, is written using digits and the Bengali ganda mark.

Modern Notation  The use of currency marks and currency numerators in the Bengali script diminished in the latter half of the 20th century when India changed the base of its currency. On April 1, 1957, India introduced a new coinage system called “Naya Paisa,” which is based on the decimal system. While the rupayā unit was retained, the ănā and ganḍā denominations were replaced with nayā paisā (নেয়া পেইসা). There are now 100 paisā in 1 rupayā, instead of the previous 16 ănā and 80 ganḍā. Currency is now written using digits and the rupee mark has been replaced with the Latin ‘Rs.’ \(U+20A8\) RUPEE SIGN (‘Re.’ is used for a single rupee). The new rupee sign is written in Indic scripts as the syllable \(ru\), which is an abbreviation for rupayā; for example, Bengali \(রু\). The Bengali script possesses the \(U+09F3\) BENGALI RUPEE SIGN, which is also used for writing the modern rupee. The Latin and Bengali rupee signs are written before the currency. However, there are several ways of separating currency units, eg. using a solidus, dash, period, and other Latin punctuation.

4 References


Figure 1: The method of transliterating Bengali currency notation to the north Indian system (from Beri, 19–? : 21). Note the use of \textit{BENGALI GANDA MARK} for writing \textit{gandā} values. In north Indian notation, the \textit{gandā} is written in the manner used for \textit{pāī}. The specimen has two typographical errors. First, Bengali \textit{àãî} is incorrectly transliterated as \textit{àãî} (rows 3 and 4, column 1); the correct form is \textit{àîã}, as in the transliteration of \textit{BD/BC}. Second, Bengali \textit{1îáî} is incorrectly transliterated as \textit{1îáî}; the correct form is \textit{1îá}, without the second \textit{NORTH INDIAN RUPEE MARK}, as in the transliteration of \textit{ëë}, \textit{ëë}, etc.

Figure 2: The method of writing fractions of the \textit{ānā} currency unit in the Bengali script (from Grierson, 1903b: 29).

The leading feature in Indian arithmetic being the division by four, the signs for fractions are adapted thereto. The rupee is divided into \(4 \times 4 = 16\) parts, called \textit{ānā} which are thus designated (units of all kinds are also thus divided):—

\[
\begin{array}{cccccccc}
1 \ & \text{ānā} & 1/6 & 2 \ & \text{ānās} & 1/12 & 3 \ & \text{ānās} & 1/18 & 4 \ & \text{ānās} & 1/24 & 5 \ & \text{ānās} & 1/30 & 6 \ & \text{ānās} & 1/36 & 7 \ & \text{ānās} & 1/42 & 8 \ & \text{ānās} & 1/48 & 9 \ & \text{ānās} & 1/54 & 10 \ & \text{ānās} & 1/60 & 11 \ & \text{ānās} & 1/66 & 12 \ & \text{ānās} & 1/72 & 13 \ & \text{ānās} & 1/78 & 14 \ & \text{ānās} & 1/84 & 15 \ & \text{ānās} & 1/90 & 16 \\
\end{array}
\]

For writing money the ordinary numerals are used with \textit{hasanta} for full rupees and smaller amounts are expressed by the following symbols:—

\[
\begin{array}{cccccccc}
\text{/o} & 1 \text{anna} & \text{1/10} & 5 \text{annas} & \text{1/15} & 9 \text{annas} & \text{1/20} & 13 \text{annas} \\
\text{1/6} & 2 \text{annas} & \text{1/12} & 6 \text{annas} & \text{1/18} & 10 \text{annas} & \text{1/24} & 14 \text{annas} \\
\text{1/18} & 3 \text{annas} & \text{1/24} & 7 \text{annas} & \text{1/30} & 11 \text{annas} & \text{1/36} & 15 \text{annas} \\
\text{1/36} & 4 \text{annas} & \text{1/42} & 8 \text{annas} & \text{1/48} & 12 \text{annas} & \text{1/54} & 16 \text{annas} \\
\end{array}
\]

Figure 3: Bengali currency notation showing use of Bengali rupee sign (from Hudson, 1965: 85). The description states that the \textit{hasanta} (BENGALI SIGN VIRAMA) is used to write rupee values. Such substitution occurs in print when the glyph for \textit{BENGALI RUPEE MARK} is absent from a font.
A. Administrative

1. Title: Proposal to Encode the Ganda Currency Mark for Bengali in the BMP of the UCS
2. Requester’s name: Anshuman Pandey (pandey@umich.edu)
3. Requester type (Member Body/Liaison/Individual contribution): Individual contribution
4. Submission date: May 21, 2007
5. Requester’s reference (if applicable): N/A
6. Choose one of the following:
   (a) This is a complete proposal: Yes
   (b) or, More information will be provided later: No

B. Technical - General

1. Choose one of the following:
   (a) This proposal is for a new script (set of characters): No
       i. Proposed name of script: N/A
   (b) The proposal is for addition of character(s) to an existing block: Yes
       i. Name of the existing block: Bengali
2. Number of characters in proposal: 1
3. Proposed category: A - Contemporary
4. Is a repertoire including character names provided?: Yes
   (a) If Yes, are the names in accordance with the “character naming guidelines” in Annex L of P&P document?: Yes
   (b) Are the character shapes attached in a legible form suitable for review?: Yes
5. Who will provide the appropriate computerized font (ordered preference: True Type, or PostScript format) for publishing the standard?: Anshuman Pandey; True Type
   (a) If available now, identify source(s) for the font and indicate the tools used: The font contains a normalized form of the sign as found in printed documents. It was drawn by Anshuman Pandey using Metafont and converted to True Type format using FontForge.
6. References:
   (a) Are references (to other character sets, dictionaries, descriptive texts etc.) provided?: Yes
   (b) Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?: Yes
7. Special encoding issues:
   (a) Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)? No
8. Additional Information: Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see http://www.unicode.org/Public/UNIDATA/UCD.html and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard. Character properties, numeric information, and currency information are included.
C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before?: **No**
2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.): **No**
   (a) If Yes, with whom?: **N/A**
   i. If Yes, available relevant documents: **N/A**
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included?: **Yes**
   (a) Reference: *The sign was used by the Bengali-speaking community.*
4. The context of use for the proposed characters (type of use; common or rare): **Common**
   (a) Reference: *The sign was used to write currency notation in the Bengali script.*
5. Are the proposed characters in current use by the user community?: **No**
   (a) If Yes, where? Reference: *The sign is not used at present.*
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP?: **Yes**
   (a) If Yes, is a rationale provided?: *The sign belongs to the Bengali script, which is encoded in the BMP. There is sufficient space in the Bengali block for the inclusion of this sign.*
   i. If Yes, reference: **N/A**
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? **Yes. It should be added to a code-point adjacent to other currency signs in the Bengali block.**
8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence?: **No**
   (a) If Yes, is a rationale for its inclusion provided?: **N/A**
   i. If Yes, reference: **N/A**
9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters?: **No**
   (a) If Yes, is a rationale provided?: **N/A**
   i. If Yes, reference: **N/A**
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character? **Yes**
    (a) If Yes, is a rationale for its inclusion provided? **Yes**
    i. If Yes, reference: *Similar in function to other currency marks. See text of proposal for additional details.*
11. Does the proposal include use of combining characters and/or use of composite sequences (see clauses 4.12 and 4.14 in ISO/IEC 10646-1: 2000)? **No**
    (a) If Yes, is a rationale for such use provided? **N/A**
    i. If Yes, reference: **N/A**
    (b) Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided? **No**
    i. If Yes, reference: **N/A**
12. Does the proposal contain characters with any special properties such as control function or similar semantics? **No**
    (a) If Yes, describe in detail (include attachment if necessary): **N/A**
13. Does the proposal contain any Ideographic compatibility character(s)? **No**
    (a) If Yes, is the equivalent corresponding unified ideographic character(s) identified? **N/A**
    i. If Yes, reference: **N/A**