Proposal to Encode the Ganda Currency Mark for Bengali in ISO/IEC 10646

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A. Administrative

1. Title: Proposal to Encode the Ganda Currency Mark for Bengali in ISO/IEC 10646
2. Requester’s name: Anshuman Pandey (pandey@umich.edu)
3. Requester type (Member Body/Liaison/Individual contribution): Individual contribution
4. Submission date: September 25, 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**
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 ganḍā (গান্ধার) currency unit. Several signs used for the writing of currency and other quantities in Bengali are already encoded in the UCS:

\[ U+09F2 \text{ BENGALI RUPEE MARK} \]
\[ U+09F3 \text{ BENGALI RUPEE SIGN} \]
\[ U+09F4 \text{ BENGALI CURRENCY NUMERATOR ONE} \]
\[ U+09F5 \text{ BENGALI CURRENCY NUMERATOR TWO} \]
\[ U+09F6 \text{ BENGALI CURRENCY NUMERATOR THREE} \]
\[ U+09F7 \text{ BENGALI CURRENCY NUMERATOR FOUR} \]
\[ U+09F8 \text{ BENGALI CURRENCY NUMERATOR ONE LESS THAN THE DENOMINATOR} \]
\[ U+09F9 \text{ BENGALI CURRENCY DENOMINATOR SIXTEEN} \]

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

\[ U+09F9 \text{ BENGALI GANDA MARK} \]

Name The mark is named the Bengali ganda mark. The name describes its function as the unit mark for the ganḍā 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 (রুপয়া) [or ṭākā (টাকা)], ānā (অনা), and ganḍā (গান্ধার). All three signs appear in written and printed materials. Signs for writing rupayā and ānā values are already encoded in the UCS. The sign for the rupayā is encoded as \[ U+09F2 \text{ BENGALI RUPEE MARK} \] and the sign for the ānā appears as \[ U+09F9 \text{ BENGALI CURRENCY DENOMINATOR SIXTEEN} \]. 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 GANDA MARK; Sc; 0; ET; ; ; ; ;

¹See the description of the north Indian currency notation system given in Pandey (2007).
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 *jakā. 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 *gandā; there are 20 *gandā in 1 *ānā. Each unit has a distinct orthography:

- The *rupayā is indicated with digits and is marked with \U09F2 BENGALI RUPEE MARK. The mark is written after the unit: “7 rupayā.”

- The *ānā is written with currency numerators. It is marked with \U09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN, which is written after the unit (see Figure 2):

\[
\begin{array}{ccccccc}
1 \text{ānā} & 5\text{ānā} & 9\text{ānā} & 13\text{ānā} \\
2 \text{ānā} & 6\text{ānā} & 10\text{ānā} & 14\text{ānā} \\
3 \text{ānā} & 7\text{ānā} & 11\text{ānā} & 15\text{ānā} \\
4 \text{ānā} & 8\text{ānā} & 12\text{ānā} & 1 \text{rupayā} \\
\end{array}
\]

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

\[
\begin{array}{ccccccc}
1 \text{gandā} & 6 \text{gandā} & 11 \text{gandā} & 16 \text{gandā} \\
2 \text{gandā} & 7 \text{gandā} & 12 \text{gandā} & 17 \text{gandā} \\
3 \text{gandā} & 8 \text{gandā} & 13 \text{gandā} & 18 \text{gandā} \\
4 \text{gandā} & 9 \text{gandā} & 14 \text{gandā} & 19 \text{gandā} \\
5 \text{gandā} & 10 \text{gandā} & 15 \text{gandā} & 1 \text{ānā} \\
\end{array}
\]

The *gandā is divided into an intermediate unit called the pāi (পাই). There are 5 *gandā in 1 pāi. Thus, \( \text{g} \) is equal to 1 pāi, \( \text{g} \) 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 (পাসা or পাসা), also an intermediate unit; there are 4 paisā in 1 ānā. The gandā unit is closer to the north Indian pāi; there are 12 pāi in 1 ānā in the latter system.2

- Historically, there is a unit smaller than the gandā called কড়ি kari. There are 4 kari in 1 gandā. The kari is written using BENGALI CURRENCY NUMERATOR FOUR and BENGALI CURRENCY NUMERATOR ONE LESS THAN THE DENOMINATOR. It is marked by the BENGALI CURRENCY DENOMINATOR SIXTEEN, which is written before the unit. Thus, 1 kari is \( \text{g} \), 2 kari is \( \text{g} \), and 3 kari is \( \text{g} \).

Only one currency mark is used when multiple units are written. This mark is typically the sign for the smallest unit. When rupayā and ānā values are written together, the Bengali rupee mark is dropped and only BENGALI CURRENCY DENOMINATOR SIXTEEN is used: “15 rupayā and 3 ānā” is written as \( \text{g} \text{g} \), not as \( \text{g} \text{g} \) or as \( \text{g} \text{g} \). When rupayā, ānā, and gandā are written together, only the gandā mark is used: “27 rupayā, 6 ānā, and 5 gandā” is written as \( \text{g} \text{g} \text{g} \). When a value contains kari, only BENGALI CURRENCY DENOMINATOR SIXTEEN is used: “2 rupayā, 5 ānā, and 3 kari” is written as \( \text{g} \text{g} \text{g} \).

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 \( \text{g} \) is used for writing all units in the north Indian system. Thus, “3 rupayā” is \( \text{g} \) in Bengali and \( \text{g} \) in Devanagari; “15 ānā” is \( \text{g} \) in Bengali and \( \text{g} \) in Devanagari. The north Indian

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2Halhed, 1778: 176–177.


**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 āna and ganḍā denominations were replaced with nayā paisa (नया पैसा). There are now 100 paisā in 1 rupayā, instead of the previous 16 āna and 80 ganḍā. Currency is now written using digits and the rupee mark has been replaced with the Latin ‘Rs.’ U+20AB 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 র 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 Proposal History

This proposal was submitted to the Unicode Technical Committee on May 21, 2007 under the title “Proposal to Encode the Ganda Currency Mark for Bengali in the BMP of the UCS” (L2/07-192). The UTC accepted the proposal

This proposal is a revision of the document submitted to the Unicode Technical Committee (UTC), titled “Proposal to Encode the Ganda Currency Mark for Bengali in the BMP of the UCS” (L2/07-192; ISO/IEC JTC1/SC2/WG2 N3311). The UTC accepted L2/07-192 on August 9, 2007. The character was tentatively allocated at U+09FB, as proposed.3

### 5 References

Beri, D. C. 19–?.


Figure 1: The method of transliterating Bengali currency notation to the north Indian system (from Beri, 19–?: 21). Note the use of Bengali ganda mark for writing gandā values. In north Indian notation, the gandā is written in the manner used for pāṭi. The specimen has two typographical errors. First, Bengali /bn_currency1/ is incorrectly transliterated as àãî (rows 3 and 4, column 1); the correct form is àîã, as in the transliteration of /bn_currency1/BD/BC and /bn_currency1/BD/BH. Second, Bengali /BD/BE is incorrectly transliterated as 1îáî; the correct form is 1îá, without the second north indian rupee mark, as in the transliteration of 1ît, 1îo, etc.

Figure 2: The method of writing fractions of the ānā currency unit (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 ānā which are thus designated (units of all kinds are also thus divided):—

<table>
<thead>
<tr>
<th>1 ānā or $\frac{1}{4}$</th>
<th>5 ānās</th>
<th>$\frac{5}{4}$</th>
<th>9 ānās</th>
<th>$\frac{9}{4}$</th>
<th>13 ānās</th>
<th>$\frac{13}{4}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ānās</td>
<td>$\frac{1}{2}$</td>
<td>6 ānās</td>
<td>$\frac{6}{4}$</td>
<td>10 ānās</td>
<td>$\frac{10}{4}$</td>
<td>14 ānās</td>
</tr>
<tr>
<td>3 ānās</td>
<td>$\frac{3}{4}$</td>
<td>7 ānās</td>
<td>$\frac{7}{4}$</td>
<td>11 ānās</td>
<td>$\frac{11}{4}$</td>
<td>15 ānās</td>
</tr>
<tr>
<td>4 ānās or $\frac{1}{4}$</td>
<td>8 ānās</td>
<td>$\frac{8}{4}$</td>
<td>12 ānās</td>
<td>$\frac{12}{4}$</td>
<td>16 ānās</td>
<td>$\frac{16}{4}$</td>
</tr>
</tbody>
</table>

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

$\frac{1}{4}$—1 anna  
$\frac{2}{4}$—2 annas  
$\frac{3}{4}$—3 annas  
$\frac{4}{4}$—4 annas  
$\frac{5}{4}$—5 annas  
$\frac{6}{4}$—6 annas  
$\frac{7}{4}$—7 annas  
$\frac{8}{4}$—8 annas  
$\frac{9}{4}$—9 annas  
$\frac{10}{4}$—10 annas  
$\frac{11}{4}$—11 annas  
$\frac{12}{4}$—12 annas  
$\frac{13}{4}$—13 annas  
$\frac{14}{4}$—14 annas  
$\frac{15}{4}$—15 annas  
$\frac{16}{4}$—16 annas  
$\frac{17}{4}$—1 rupee

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