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SUPPLEMENT

KARAṆAKUTŪHALAM OF BHĀSKARĀCĀRYA II

An English Translation with Mathematical Explanation,
Derivations, Examples, Tables and Diagrams
(Chaps. 9, 10 & 11)

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CONTENTS

CHAPTER 9

PĀTĀDHIKĀRAḤ

(Parallel Aspects of Sun and Moon)

The equality of the declinations of the Sun and the Moon, in magnitude (with the same or opposite directions) is called *vyatīpāta* or *vaidhṛti pāta* according as the declinations of the Sun and the Moon are on the same side or on opposite sides of the celestial equator. In western astrology these are referred to as "*parallel aspects*" of the Sun and the Moon.

***Ślokas* 1 and 2 (I^st^ half) : Without the *sapāta candra* (Moon added with node), the Sun and the Moon (both) added with the *ayanāmśa* (precession of the equinox) are considered.**

60°

The sum (*yoga*) of these (i.e. the tropical Sun and the Moon) is *vyatipāta* or *vaidhṛta* according as it (the sum) is six *rāśis* or twelve *rāśis*. If (the sum) is less or greater than (either) *pāta* (i.e. *vyatīpāta* or *vaidhṛta*) then the difference in arc minutes (*liptis*) divided by the sum of the (daily) motions (of the Sun and the Moon) is the number of days to come for since or elapsed (the *pāta*).

If the sum of *sāyana* Ravi and *sāyana* Candra is equal to 6 *rāśis,* (i.e. 180°), the *yoga* is called the *vyatīpāta.* If the sum is 12 *rāśis* (i.e), it is called *vaidhṛti pāta.*

If the sum is less than 6 or12 *rāśis*, correspondingly the *vyatīpāta* or the *vaidhṛti pāta* is due (*eṣya*). On the other hand, if the sum is greater than 6 or 12 *rāśis,* the said *pāta* is over *(gata).*

For a given date, the number of days etc. of the *gata* or *gamya* period for the *vyatīpāta* and *vaidhṛtipāta* are determined as follows :

(i) Let S and M be the *sāyana* Sun and the *sāyana* Moon. Find the difference of (S + M) from or (whichever is closer) and divide it by the sum of the true daily motions of the Sun and the Moon (taking the numerator and the denominator in the same unit of angle, say, *kalās*).

(ii) Depending on whether (S + M) is greater than or respectively the *vyatīpāta* or the *vaidhṛti pāta* is *gata* (elapsed) by so many days etc. given by the quotient.

(iii) Similarly, if (S + M) is *less* than respectively *pāta* is *gamya* (to be covered).

The method of considering (S + M) in the above *ślokas* for finding the *gata* or *gamya* of the *pātas* is only an opproximate one since in this process the latitude of the Moon is ignored. The following *ślokas* give the accurate method of determining the *pātās*.

***Ślokas* 2 (2nd half) and 3** : **At that instant (of *vyatīvaidhṛti pāta*) these two bodies (i.e. the *sāyana* Sun and Moon) and the (Moon's) node are determined and then the latitude (of the Moon) in minutes (*kalās*) as earlier.**

The *pāta* has to be known as elapsed (*yāta, gata*) if the (*sāyana*) Moon is in the odd or even quadrant and (correspondingly) in the same or opposite hemisphere as the Moon added with its node (*sapāta candra*). The *pāta* is yet to take place *(gamya*) otherwise.

At the instant of *vyatī* or *vaidhṛti pāta* find the true *(sāyana)* Sun, Moon and the Moon's *pāta* (i.e. ° – . Then

(i) if the *sāyana* Candra lies in an odd quadrant (*oja pāda*) and also the *sāyana* Candra and *sapāta* Candra lie in the same hemisphere, then the related *pāta* is over (*gata*).

(ii) if the *sāyana* Candra is in an even quadrant (*sama* or *yugma pāda*) and the *sapāta* Candra and the *sāyana* Candra are in different hemispheres, then also the related *pāta* is over *(gata).*

(iii) if the *sāyana* Candra is in the even quadrant and the *sāyana* Candra and *sapāta* Candra lie in the same hemisphere then the related *pāta* is yet to take place (*gamya* or *eṣya*).

(iv) if the *sāyana* Candra is in the odd quadrant and in the hemisphere different from that of the *sapāta* Candra, then the related *pāta* is *gamya* (yet to take place).

The above conclusions are shown in Table 9.1

Table 9.1 *Gata* and *Gamya* of *pātas*

Sāyana Candra	*Sapāta* Candra and *Sāyana* Candra	*Pāta*
(i) Odd quadrant	same hemisphere	*gata* (over)
(ii) Even quadrant	different hemispheres	*gata* (over)
(iii) Even quadrant	same hemisphere	*gamya* (due)
(iv) Odd quadrant	different hemispheres	*gamya* (due)

$^{R}2^{R}121^{\circ}40'32''1'''$

Example : *Śaka* 1539 *Kārtika kṛṣṇa* 10 (*daśamī*), Tuesday.

Gatābda = 434 years, *Ahargaṇa* = 158751.

This corresponds to October 23, 1617 (G).

At the sunrise at Yodhapurī, (*nirayaṇa*) True Sun =

(*Nirayaṇa*) True Moon $= 4^{R}\ 12^{\circ}\ 02'\ 47''$

Ayanāmśa $= 18^{\circ}\ 14'\ 34''$, Moon's *pāta*

Sāyana Ravi = ° ′ ″ ≡ , *Sāyana* Candra

$S + M$

Now, + − = ° ′ ″ ′ ″

Since , the *vaidhṛti pāta* is over *(gata).*

The sum the true daily motions of the Sun and the Moon,

$$DS + DM = 801' 58''.$$

Therefore, dividing $(S + M) - 12^R$ by (*DS* + *DM*), we get

$$\frac{77' 27''}{801' 58''} \text{ day} \quad .$$

This means that the *vaidhṛti pāta* took place $5^{gh}\ 47^{vig}$ before the sunrise of Tuesday i.e. at $60^{gh} - 5^{gh}\ 47^{vig} = 54^{gh}\ 13^{vig}$ of the previous day i.e. of the *navamī.*

At the instant of the *vaidhṛti pāta* ie., at $54^{gh}\ 13^{vig}$ of *navamī* (Monday) we have

(*Nirayaṇa*) True Sun $= 6^R\ 12^\circ\ 39'\ 35''$

(*Niryaṇa*) True Moon $= 4^R\ 10^\circ\ 51'\ 17''$

Moon's *pāta* $= 2^R\ 1^\circ\ 02'\ 13''$

Sāyana Sun = ° ′ ″ ≡

Sāyana Moon

i.e.

Sapāta Candra $= 6^R\ 11^\circ\ 53'\ 30''$

Śara $= 57 \mid 29$ *kalās* (South)

Here, *sāyana* Candra is in the even (II) quadrant, the *sāyana* Candra is in the *uttaragola* (northern hemisphere) and the *sapāta* Candra is in the *dakṣiṇa gola* (southern hemisphere) i.e., the two are in different hemispheres. Therefore, *vaidhṛti pāta* is *gata* (over) from condition (ii) of Table 9.1.

$+ M = 12^R\ 0^\circ\ 0''\ 0''$

***Śloka* 4** : **The (six) *khaṇḍas* each of the declination (*krānti*) and the latitude (*śara*) are considered respectively as positive, negative, positive and negative (in the four quadrants).**

The (longitudes in) degrees of (*sāyana*) Moon and of the Moon added with its node (*pāta*) are divided (separately) by 15; the quotients are the elapsed blocks (*khaṇḍas*).

The positive and negative signs of the *krānti khaṇḍas* are explained.

The six *krānti khaṇḍas* are 362, 341, 299, 236, 150, 52. These are written first in the given order and then in the reverse order. These 12 *khaṇḍas* are repeated. Those in the given order are positive and those in the reverse order the negative.

These 24 *khaṇḍas* with their signs are distributed into the four quadrants (*pādas*) in the natural order. The distribution of the *khaṇḍas* into the quadrants at intervals of 15° is shown in Table 9.2

Table 9.2 *Krānti Khaṇḍas* in the quadrants

I Quadrant	362	341	299	236	150	52
II Quadrant	– 52	– 150	– 236	– 299	– 341	– 362
III Quadrant	362	341	299	236	150	52
IV Quadrant	– 52	– 150	– 236	– 299	– 341	– 362

(see *Ślokas* 13 and 14 of *Tripraśnādhikāra*).

Similarly, the six *śara khaṇḍas* viz., 70, 65, 56, 43, 27, 9 [given in *Ślokas* 6 and 7 (first half), Candra *grahaṇādhikāra*] are distributed as explained in the above *ślokas.*

Remark : In Table 9.2, we consider the differences (*khaṇḍas*) of the *krānti* (declination) for angles at intervals of . These values are compared in Table 9.3. with the actual values obtained from the expression

.... (1)

Table 9.3 *Krānti* values for λ

Krānti	362	703	1002	1238	1388	1440
Krānti *(from 1)*	362.57	704.04	1002.89	1237.48	1388.02	1440

Finding the *gata* (elapsed) *khaṇḍas* using Table 9.2 is explained: (i) Express the *sapāta* Candra in degrees etc. Divide this by 15. Then the quotient gives the number of *gata śara khaṇḍas* and the remainder is used to find the elapsed part of the *bhogya śara khaṇḍa.* (ii) A similar procedure for the *krānti khaṇḍas* is adopted by considering the *sāyana Candra.*

Example : *Sapāta* Candra $= 191^\circ\ 53'\ 30''$.

Dividing by 15, we get quotient = 12 and remainder .

This means that out of 24 *śara khaṇḍas* 12 are over *(gata)* i.e. 70, 65, 56, 43, 27, 9; . The 13th *khaṇḍa* is the *bhogya khaṇḍa* = 70.

Śara of Moon

Similarly, we have *Sāyana* Candra $= 4^R\ 29^\circ\ 05'\ 51'' = 149^\circ\ 05'\ 51''$

Dividing the above value by 15, we get quotient =9 and remainder = . This means that 9 *krānti khaṇḍas* viz. 362, 341, 299, 236, 150, 52, – 52, – 150, – 236 are over *(gata)*. The *bhogya khaṇḍa* = – 299.

Ślokas 5, 6 and 7 : **In (the case of) a *pāta* elapsed (*gata*) the remainder degrees, for direct and reverse considerations, are called *cāpāmśas* (for both *śara* and *krānti*). In (the case of) a *pāta* yet to take place (*gamya*), the remainder degrees subtracted from 15^0 are considered *cāpāmśas*. Starting with *bhogya khaṇḍas* of *krānti* and *śara* two or three *khaṇḍas* are placed separately. The directions of the *krānti* and *śara* are (respectively) those of (*sāyana*) Moon and the node added to the Moon. The *krāntis* corrected with *śaras* (by algebraic summation) are the true (*sphu-a*) *śaras*.**

Obtaining the corrected *gata* and *eśya pāta kālas* is explained: (i) If the *pāta* is over *(gata)*, then the remainders obtained, from the *krānti khaṇḍas* and *śara khaṇḍas* (in previous *ślokas*) are considered as *cāpāmśas*. [Thus, in the example, *krānti cāpāmśa* and *śara cāpāmśa*].

(ii) In the case of *pāta* being *gamya* (due to occur), consider as *cāpāmśas*.

In the case of a *pāta* being *gata* (over) if the *sapāta* Candra is in an even quadrant consider the *khaṇḍas* prior to the *bhogya khaṇḍa*. In the case of *sapāta* Candra being in an odd quadrant, consider the *khaṇḍas* following the *bhogya khaṇḍa*. The direction of the *krānti* is the same as that of the *sāyana* Candra. Similarly, the direction of the *śara* is that of the *sāyana sapāta* Candra. The *krānti* corrected (*samskṛta*) *śara* is given by the algebraic sum of the *krānti* and the *śara*. To this algebraic sum, of the *krānti bhogya khaṇḍa* is combined (i.e. added or subtracted based on its sign).

***Ślokas* 8 and 9 : The successive latitude blocks (*śara khaṇḍas*) are subtracted from fifteen times the Moon's *śara*. The remainder is divided by the *aśuddha* (not subtractable) *bhogya khaṇḍa* and (the result in degrees) added to the sum of the *śuddha* (subtracted successively) *khaṇḍas*. The result multiplied by 60 and divided by the (true daily) motion of the Moon is the instant of the middle (*madhyakāla*) of the *pāta* in days etc.**

Determining the *madhya* (middle) of the *pāta* is explained:

Multiply the *śara* of Candra by 15. From this product go on subtracting the successive *śara khaṇḍas* as long as it is possible to do so (such *khaṇḍas* are called *śuddha khaṇḍas*). The immediate *khaṇḍa* which cannot be subtracted is called the *aśuddha khaṇḍa*. The remainder, obtained after subtracting all the *śuddha khaṇḍas* (from $15 \times$ *śara*) is divided by the *bhogya khaṇḍa* and the result in *amśas* etc. is added to the sum of *śuddha khaṇḍas*. Multiply by 60 and divide by the true daily motion of the Moon. The result in days etc. is the *madhya kāla* of the *pāta*.

The *madhya pāta* occurs before or after the days etc. obtained above according as the *pāta* is *gata* or *gamya*.

***Śloka* 10 : In the determination of *pāta*, if the *bhogya khaṇḍa* of the Moon's declination (*krānti*) is subtractable from (i.e. less than) the (*bhogya*) *khaṇḍa* of the latitude (*śara*) then the nature of the elapsed (*gata*) and to occur (*eṣya*) *pāta* gets reversed (i.e. *gata*, becomes *gamya* and the *gamya* becomes *gata*).**

A special case is considered.

In case the *bhogya khaṇḍa* of the *krānti* of the (*sāyana*) Candra is subtractable from (i.e. less than) the *bhogya śara khaṇḍa*, then the *gata* and *gamya* characteristics of the *pāta* get reversed.

***Śloka* 11 : Division of 2203 by the *aśuddha khaṇḍa* (not subtractable block), is the *sthiti* (half-interval of the *pāta*) either before or after the middle (*madhya* of the *pāta*).**

Determination of the *sthiti* of the *pāta* is explained:

Divide 2203 by the *aśuddha khaṇḍa*. The quotient gives the *sthiti* (i.e. the half-interval in *gh*) of the *pāta*.

If the *pāta* is *gata* (over), then subtract *sthiti* from the *pāta madhya kāla* to get the end (*mokṣa*) of the *pāta*. Adding the *sthiti* to the *madhya kāla*, we get the beginning (*sparśa*) of the *pāta*.

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[On the other hand, if the *pāta* is *gamya* (due), the process is reversed.]

Example : We have

the *aśuddha khaṇḍa* = 392.

Sthiti = = $5\vert 37$ *gh.*

Pāta madhya kāla = $16\vert 05$ *gh.*

Since the *pāta* is *gata* (elapsed), we get

Pāta mokṣa kāla = $16\vert 05 - 5\vert 37 = 10\vert 28$ *gh.*

Pāta sparśa kāla = $16\vert 05 + 5\vert 37 = 21\vert 42$ *gh.*

The above timings for the middle, the end and the beginning are before the sunrise of the given day. Subtracting these timings from 60 *gh.*,

we get the timings from the sunrise of the day of the *pāta* (in this case, it is the previous day). Thus, we have on the *navamī* (Monday)

the *sparśa kāla* = $38\big|18$ *gh.*

the *madhya kāla* = $43\big|55$ *gh.*

the *mokṣa kāla* = $49\big|32$ *gh.*

of the *vaidhṛti pāta.*

Ślokas* 12 and 13 : When all the *khaṇḍas* are subtracted (successively), the remainder (from which the next *khaṇḍa* cannot be subtracted) multiplied by 15 if exceeds 480 then there is no possibility of a *pāta.* When there is a possibility (of the *pāta*) the elapsed and yet to occur timings are obtained on division by the *viśuddha* (not subtractable) *khaṇḍa.

The remainder of *śara* in the process of finding the *śara*, is multiplied by 15. If the product is less than 480, then there is a possibility of *pāta.*

If the product is greater than 480, then there will be no *pāta.*

Śloka* 14 : The balance of the *śara* for which *pāta* is possible is subtracted from 480. The remainder is multiplied by 9 and divided by the *antya* (the last) *khaṇḍa.* Half of the thus obtained result in *ghaṭīs* is the *sthiti.

This duration before and after the instant of the middle of the *pāta* gives respectively the *sparśa* (beginning) and the *mokṣa* (end) of the *pāta.*

Śloka* 15 : If the difference between the *krāntis* is less than half of the sum of the diameters of the Sun and the Moon, it should be understood that then there is equality of *krāntis* (declinations). In that case there will be the *sthiti* of the *pāta.

CHAPTER 10

RAVĪNDU PARVĀDHIKĀRAḤ

(Fortnights with Eclipse Possibilities)

In this chapter, the possibility or otherwise of an eclipse at the end of a bright or dark lunar fortnight is discussed.

***Śloka* 1 : The *māsagaṇa* is multiplied by 2 and divided by 3 and (the degrees) added with 272 and 20th part of the years (elapsed since the epoch, *gatābda*). Sun's *gha-ī phalam* divided by 5 is added to or subtracted (appropriately) from the (above) result (in degrees). The *rāśi* place (in this result) is added with the *māsagaṇa.* In a solar eclipse a half-*rāśi* (i.e. 15^0) is added. (Removing the multiplies of 12 *rāśis*) the *bhuja* (in degrees) added with half of itself is the *śara* in *aṅgulas*.**

(i) Multiply the *māsagaṇa* by 2 and divide by 3. Add 272 to the resulting quotient. Add / of the *gatābda* (elapsed years since the epoch).

(ii) Divide the *arkaghaṭīphalam* by 5. Add (algebraically) the resulting quotient to the result of (i). Divide the result in degrees, thus obtained, by 30 to get the same in *rāśis* etc.

Add the *māsagaṇa* to the *rāśi* position and remove the multiples of 12 and consider the remainder (along with degrees etc.). Find the *bhuja* of this remainder. Add − of the *bhuja* to itself to get the *śara* in *aṅgulas*. This process is meant for a lunar eclipse.

In the case of a *solar eclipse*, add − *rāśi* (i.e., °) to the remainder in *rāśis* etc. obtained in the above step and then find the *bhuja*.

Example (Lunar eclipse) : *Śaka* 1542, *Mārgaśīrṣa pūrṇimā*, Wednesday.

Gatābda = 437, *Māsagaṇa* = 5414.

We have

(i) × / = ° ′.

(ii) Adding 272, we get .

(iii) Adding = ° ′ to the result of (ii), we get

(iv) *Arka ghaṭī phalam* = 3 *gh.*

(v) Dividing the result of (iv) by 5 we have = ° ′.

Since Ravi = is within the range of from *Karkaṭaka* to *Makara* the above value ° ′ is to be subtracted from the result of (iii). We have

– = .

(vi) Dividing by , we get ° ′.

Adding the *māsagaṇa* 5414 to the *rāśi* place, we get ° ′.

Removing the multiples of 12, we get the remainder ° ′.

Bhuja = ° ′

Śara = = | *aṅg.*

Example (Solar eclipse) : *Śaka* 1522 *Śrāvaṇa Amāvāsyā*, Monday.

Gatābda = 417, *Māsagaṇa* = 5161

True Ravi = ° ′ ″

(i) × / = ° ′

(ii) = ° ′

(iii) Adding = ° ′ to the result of (ii), we get

(iv) *Arka ghaṭīphalam* = 3 *gh.*

Dividing the above by 5, we have

Since Ravi is before *Karka*, is negative.

We have

– =

Dividing by , we get ° ′ ″

Adding the *māsagaṇa* 5161 to the *rāśi* position

we get ° ′ ″.

Removing the multiples of 12, we get the remainder, .

Since this is a case of *solar eclipse* adding to the above, we get

° ′ ″

∴ *Bhuja* of = ° ′ ″

Śara = = | *aṅg.*

***Śloka* 2 : The *nata* in *gha-ikās* (*nāḍīs*) at the new moon divided by 4 in *rāśis* (etc.) is subtracted from or added to the (true) Sun (at the newmoon) according as he is in the east or west. The *bhuja* of this**

(result is) added with *ayanāṃśa* (and its) *bhuja* is multiplied by 7 *rāśis* minus *bhuja*; twice this gives the *krānti* (declination) in degrees etc. Then (this *śara*) combined, as earlier, with the latitude (*akṣa*) of the place is the *natāṃśa* (in degrees); that (*natāṃśa*) divided by 4 is *nati* (in *aṅgulas*). This (*nati*) is combined with the *śara* (to get the *nati* corrected *spaṣ-a śara*) in a solar eclipse.

Find out the *nata* at the *darśānta* (new moon) *kāla*. [Refer *Ślokas* 1, 2, 3 in *Candra grahaṇādhikāraḥ*]. Divide this *nata* by 4 to get the result in *rāśis* (with its fraction which must be converted into degrees).

The above obtained *rāśis* etc. is added to or subtracted from the true (*nirayaṇa*) Sun at the *darśānta kāla* according as the Sun is in the *pūrva* (eastern) or *paścima* (western) *kapāla*.

Add *ayanāṃśa* and then find the *bhuja* of the result. Subtract the *bhuja* from 7 *rāśis*. Multiply the difference by *bhuja*. This multiplied by 2 gives the *krānti*.

Natāṃśa = *Krānti* ± *aksaṃśa* ≡ $\delta - \phi$

Nati = *Natāṃśa* / *4*

Spaṣṭa śara = Algebraic sum of *nati* and *śara*.

Example : *Darśānta kāla* = |

(see the example under Chapter 5 on *Sūryagrahaṇa*).

Dinārdham = |

Natam = *Darśānta* – *dinārdham*

= | – | = |

(i) We have | / = ° ′ ″.

(ii) At *darśānta*, true Sun = ° ′ ″.

(iii) Since the *natam* is western, the result of (i) is added to that of (ii).

We get

° ′ ″ ° ′ ″ = ° ′ ″.

Adding *ayanāṃśa* = ° ′ to the above result, we get

(iv) *Bhuja* = ° ′ ″

(v) – *Bhuja* = ° ′ ″

(vi) (– *Bhuja*) × *Bhuja* =

(vii) Multiplying by 2, we get | |

i.e., *Krānti* = ° ′ ″ ≡ δ

(viii) *Akṣāṃśa* for the place

(ix) *Natāṃśa* = – = – – = –

(x) *Nati* = – *aṅg* (south)

(xi) *Nati* corrected *śara*

i.e., *Spaṣṭa śara* = *Nati* + *śara* (algebraic sum)

= – – | i.e., | *aṅg*. (South)

***Śloka* 3** : **When the latitude (*śara,* in *aṅgulas*) of the Moon is less than the *mānaikyārdha khaṇḍa* 19 or 11 (*aṅgulas*), the lunar or the solar eclipse (respectively) is possible as thought out by the learned in the past.**

The possibility of occurrence of an eclipse is explained.

(1) If the *śara* of the Moon is less than the *mānaikyakhaṇḍārdha* 19 *aṅgulas* then there is a possibility of a lunar eclipse. Similarly in the case of a solar eclise, if the *śara* is less than the *mānaikyārdha* 11 *aṅgulas* then there is a possibility of occurrence of a solar eclipse.

(2) **Consider the sum of the mean Sun (without the *kṣepaka*) and *pāta* along with their revolutions (*bhagaṇas*). Multiply this by 2 and add 2. Divide the result by 7. If the remainder is 1, 2,....., 6, 7 (or 0) then the corresponding *parveśa* (lord of the lunar fortnight) is *Brahmā, Candra, Indra, Kubera, Varuṇa, Agni* and *Yama.***

***Śloka* 4** : **Among the cultured families there was a *Brāhamaṇa* (*dvija*) by name Maheśvara born in the *Śāṇḍilya gotra,* who was an erudite in *śrauta* (related to *Vedic* and *Upaniṣadic* scriptures), *smārta* (related *smṛtis*) knowledge and thinking and who was an ocean of culture and courtesy. Maheśvara was an embellishment among the knowers of *Jyotiśśāstra* (astronomy). His son, Bhāskara who was a poet, composed this text of *Karaṇa Kutūhalam* by his own talent and virtues.**

CHAPTER 11

*NĪRADĀRKA VICĀRAḤ**

(On possibility of rains)

***Ślokas* 1, 2, 3 : From the (position of) the Sun made equal in *kalās* (minutes of arc with the Moon) the intelligent should subtract one *rāśi* and fourteen degrees and the remainder should be removed from the *cakra* (i.e. one circle of 21,600 minutes of arc).**

(The remainder) reduced to *kalās* is squared, doubled and divided by the minutes of a *cakra* (i.e. by 21,600).

The result is *āḍhya* (in *rāśis* etc) together with thirteen degrees is added to the arc minute-equated Sun. Subtracting the Sun at the sunrise from the above and the remainder added to the *āḍhya* is the corrected *nīradārkaḥ* (rain yielding Sun).

(1) From the Sun at the *samakala* (instant of newmoon and full moon) subtract ° . Again, subtract the thus obtained difference from (*cakra*) to get *cakra śuddha* Ravi.

(2) Express the *cakra śuddha* Ravi in *kalās*, take the square of this and multiply the square by 2.

(3) Divide the result of (2) by in *kalās* i.e., by .

(4) Express the result of (3) in *rāśis* etc., This is called *āḍhya*. Add to the *āḍhya*. Add this to the *samakāla* Sun.

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*Sumatriharṣa in his comm. on the *Karaṇakutūhala* has appended this chapter. The chapter appears to be a later interpolation (*prakṣipta*) and does not have any astronomical significance.

(5) Subtract the Sun at the sunrise from the result of (4). This is added to the earlier obtained *āḍhya*. The result thus obtained is called *nīrada arka.*

Example : *Samakāla* Sun = ° ′ ″

Now, ° ′ ″ – = ° ′ ″

Cakra śuddha Ravi = – = ° ′ ″

= ′ ″(in *kalās* etc.)

Squaring the above value, we get = |

Multiplying by 2, (|)× = | ..... (1)

We have = *kalās*. ..... (2)

Dividing (1) by (2), we get

Āḍhya saṃjñā = = ′ ″ =

=

Āḍhya saṃjña

Samakāla Sun =

Adding, we get the corrected *samakāla* Ravi =

(removing one revolution of).

Sun at sunrise

Sun at sunrise – corrected *samakāla* Ravi

= – =

Adding this to the *āḍhya saṃjña*, we get

=

i.e., *Nīradārka* =

***Ślokas* 4, 5, 6 : Seeing (the rain yielding Sun) in the *navāṃśas* of the Sun or Kuja (Mars) cloudless sky must be declared. If the *nīradārka* is in the *navāṃśas* of Śani (Saturn) or Budha (Mercury) there will be a little rain; (if) in the *navāṃśas* of Candra (Moon) or Śukra (Venus), in the rainy times there will be heavy rain-fall; (if) in the *navāṃśa* of Guru (Jupiter) there will be heavy winds and little rain.**

I worship, with flowers in my folded palms the pair of feet of those who are learned in (matters like) the *grahaṇa, vilagna* and the *megacchāya*.

The use of the *nīradārka* is given.

If the *nīradārka* is in the *navāmśa* of

(i) Ravi or Kuja, then there will be no clouds;

(ii) Śani or Budha, then there will be a little rain; and

(iii) Candra or Śukra, then there will be heavy rain.

(iv) Guru, then there will be scanty rain with heavy winds.

Example : In the example considered earlier, *nīradārka* = i.e., in the *Mīna rāśi* i.e., in the 5th *navāmśa* of *Mīna* which falls in the *Vṛścika navāmśa*. The *adhipati* (lord) of *Vṛścika is* Kuja (Mars). Accroding to (i) in the above *ślokas*, there will be no clouds and hence no rain.

Appendix - 1

Ahargaṇa

[For *Karaṇakutūhalam* (*KK*) Epoch: Feb 24, 1183, Thursday
Epochal Kali days: 15,64,737]

Table 1

Chris. Year	**Julian Days**	***Kali Ahargaṇa***	***KK Ahargaṇa***
1000 (J)	2086308	1497842	–66895
1100 (J)	2122833	1534367	–30370
1200 (J)	2159358	1570892	6155
1300 (J)	2195883	1607417	42680
1400 (J)	2232408	1643942	79205
1500 (J)	2268933	1680467	115730
1500 (G)	2268923	1680457	115720
1600 (G)	2305448	1716982	152245
1700 (G)	2341972	1753506	188769
1800 (G)	2378496	1790030	225293
1900 (G)	2415020	1826554	261817
2000 (G)	2451545	1863079	298342
2100 (G)	2488069	1899603	334866
2200 (G)	2524593	1936127	371390

Note : (1) In Table-3, the first two columns are headed by C and B which stand respectively for a *common* (non leap) year and *bissextile* (leap) year.

For a given date in a leap year, only for January and February, the column headed by B must be used. For other months even in a leap year and for all months in a common year the first column under C must be used.

(2) In Table-1, the letters J and G in brackets represent respectively the *Julian* and the *Gregorian* calendars.

Table 2 : *Ahargaṇa* for Year Beginnings

Year	Days	Year	Days	Year	Days	Year	Days
0	0	28	10227	56	20454	84	30681
1	365	29	10592	57	20819	85	31046
2	730	30	10957	58	21184	86	31411
3	1095	31	11322	59	21549	87	31776
4	1461	32	11688	60	21915	88	32142
5	1826	33	12053	61	22280	89	32507
6	2191	34	12418	62	22645	90	32872
7	2556	35	12783	63	23010	91	33237
8	2922	36	13149	64	23376	92	33603
9	3287	37	13514	65	23741	93	33968
10	3652	38	13879	66	24106	94	34333
11	4017	39	14244	67	24471	95	34698
12	4383	40	14610	68	24837	96	35064
13	4748	41	14975	69	25202	97	35429
14	5113	42	15340	70	25567	98	35794
15	5478	43	15705	71	25932	99	36159
16	5844	44	16071	72	26298		
17	6209	45	16436	73	26663		
18	6574	46	16801	74	27028		
19	6939	47	17166	75	27393		
20	7305	48	17532	76	27759		
21	7670	49	17897	77	28124		
22	8035	50	18262	78	28489		
23	8400	51	18627	79	28854		
24	8766	52	18993	80	29220		
25	9131	53	19358	81	29585		
26	9496	54	19723	82	29950		
27	9861	55	20088	83	30315		

Table 3 : *Ahargaṇa* for Days of a Year

Dates		**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
C	**B**												
0	1	0	31	-	-	-	-	-	-	-	-	-	-
1	2	1	32	60	91	121	152	182	213	244	274	305	335
2	3	2	33	61	92	122	153	183	214	245	275	306	336
3	4	3	34	62	93	123	154	184	215	246	276	307	337
4	5	4	35	63	94	124	155	185	216	247	277	308	338
5	6	5	36	64	95	125	156	186	217	248	278	309	339
6	7	6	37	65	96	126	157	187	218	249	279	310	340
7	8	7	38	66	97	127	158	188	219	250	280	311	341
8	9	8	39	67	98	128	159	189	220	251	281	312	342
9	10	9	40	68	99	129	160	190	221	252	282	313	343
10	11	10	41	69	100	130	161	191	222	253	283	314	344
11	12	11	42	70	101	131	162	192	223	254	284	315	345
12	13	12	43	71	102	132	163	193	224	255	285	316	346
13	14	13	44	72	103	133	164	194	225	256	286	317	347
14	15	14	45	73	104	134	165	195	226	257	287	318	348
15	16	15	46	74	105	135	166	196	227	258	288	319	349
16	17	16	47	75	106	136	167	197	228	259	289	320	350
17	18	17	48	76	107	137	168	198	229	260	290	321	351
18	19	18	49	77	108	138	169	199	230	261	291	322	352
19	20	19	50	78	109	139	170	200	231	262	292	323	353
20	21	20	51	79	110	140	171	201	232	263	293	324	354
21	22	21	52	80	111	141	172	202	233	264	294	325	355
22	23	22	53	81	112	142	173	203	234	265	295	326	356
23	24	23	54	82	113	143	174	204	235	266	296	327	357
24	25	24	55	83	114	144	175	205	236	267	297	328	358
25	26	25	56	84	115	145	176	206	237	268	298	329	359
26	27	26	57	85	116	146	177	207	238	269	299	330	360
27	28	27	58	86	117	147	178	208	239	270	300	331	361
28	29	28	59	87	118	148	179	209	240	271	301	332	362
29	30	29	-	88	119	149	180	210	241	272	302	333	363
30	31	30	-	89	120	150	181	211	242	273	303	334	364
31	-	31	-	90	-	151	-	212	243	-	304	-	365

Ahargaṇa according to *Karaṇa kutūhalam* (for a given Christian date)

The epoch of *Karaṇa kutūhalam* (*KK*) adopted is February 24, 1183 (Julian) AD, Thursday, Mean sunrise at Ujjayinī i.e. 6^h 27^m IST (*Kali ahargaṇa*: 15,64,737). Finding the ***ahargaṇa*** from the Christian date:

In Table 1, for the beginning of the Christian century (column 1), determined by the first two digits of the four digit year, Julian day number, the *Kali ahargaṇa* and the *KK ahargaṇa* are given.

In Table 2, the number of days from the beginning of the century upto the beginning of each year is given. In Table 3, the number of days during the year upto the given date are listed.

The corresponding entries from Tables 1, 2 and 3 are added to give the *KK ahargaṇa* for the given Christian date. Similarly, JD and *Kali* days can also be determined.

Weekday from KK *ahargaṇa*: Divide the *KK ahargaṇa* (*A*) by 7 and let the remainder be denoted by *R*. If $R = 0$, then Thursday, 1: Friday, 2: Saturday etc.

Example: Consider June 12, 2007, Tuesday. We have from Tables 1, 2 and 3 as follows:

			Kali ahar.	*KK ahar.*
(Table 1)	2000(G)	:	18,63,079	2,98,342
(Table 2)	year 7	:	2,556	2,556
(Table 3)	June 12	:	163	163
(Date 12 under C)				
	Total	:	18,65,798	3,01,061

Weekday: Here, A = 3,01,061. Dividing A by 7, we get remainder R = 5. Counting 0 as Thursday, 1 as Friday etc., R = 5 gives Tuesday.

Appendix - 2

Manda Equations of Kuja, Budha, Guru, Śukra, Śani according to *Sūrya Siddhānta*

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	12	29	0	5	0	0	5	30	0	2	0	0	8	10
2	0	24	58	0	9	58	0	10	59	0	3	59	0	16	19
3	0	37	24	0	14	56	0	16	28	0	5	58	0	24	28
4	0	49	49	0	19	53	0	21	56	0	7	57	0	32	36
5	1	2	12	0	24	49	0	27	24	0	9	55	0	40	43
6	1	14	33	0	29	44	0	32	50	0	11	52	0	48	48
7	1	26	51	0	34	38	0	38	16	0	13	49	0	56	53
8	1	39	7	0	39	30	0	43	40	0	15	46	1	4	56
9	1	51	20	0	44	21	0	49	4	0	17	42	1	12	58
10	2	3	30	0	49	10	0	54	26	0	19	37	1	20	58
11	2	15	37	0	53	58	0	59	47	0	21	31	1	28	56
12	2	27	40	0	58	44	1	5	6	0	23	25	1	36	52
13	2	39	40	1	3	29	1	10	24	0	25	18	1	44	46
14	2	51	35	1	8	11	1	15	41	0	27	10	1	52	38
15	3	3	27	1	12	52	1	20	55	0	29	1	2	0	28
16	3	15	14	1	17	31	1	26	8	0	30	52	2	8	15
17	3	26	57	1	22	8	1	31	19	0	32	41	2	15	59
18	3	38	35	1	26	42	1	36	28	0	34	30	2	23	41
19	3	50	8	1	31	15	1	41	35	0	36	18	2	31	20
20	4	1	36	1	35	45	1	46	40	0	38	5	2	38	55
21	4	12	59	1	40	13	1	51	42	0	39	50	2	46	28
22	4	24	16	1	44	38	1	56	43	0	41	35	2	53	57

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
23	4	35	28	1	49	1	2	1	40	0	43	19	3	1	22
24	4	46	34	1	53	22	2	6	36	0	45	2	3	8	44
25	4	57	34	1	57	40	2	11	28	0	46	43	3	16	3
26	5	8	27	2	1	55	2	16	18	0	48	24	3	23	17
27	5	19	15	2	6	7	2	21	6	0	50	3	3	30	28
28	5	29	55	2	10	17	2	25	50	0	51	42	3	37	34
29	5	40	29	2	14	24	2	30	32	0	53	19	3	44	36
30	5	50	56	2	18	28	2	35	11	0	54	55	3	51	34
31	6	1	16	2	22	29	2	39	46	0	56	29	3	58	28
32	6	11	29	2	26	27	2	44	19	0	58	3	4	5	17
33	6	21	34	2	30	22	2	48	48	0	59	35	4	12	1
34	6	31	32	2	34	13	2	53	14	1	1	6	4	18	40
35	6	41	22	2	38	2	2	57	36	1	2	35	4	25	15
36	6	51	4	2	41	47	3	1	56	1	4	3	4	31	44
37	7	0	39	2	45	29	3	6	11	1	5	30	4	38	8
38	7	10	5	2	49	8	3	10	24	1	6	56	4	44	27
39	7	19	22	2	52	43	3	14	32	1	8	20	4	50	41
40	7	28	32	2	56	15	3	18	37	1	9	43	4	56	49
41	7	37	32	2	59	44	3	22	38	1	11	4	5	2	52
42	7	46	24	3	3	8	3	26	35	1	12	24	5	8	49
43	7	55	7	3	6	30	3	30	28	1	13	43	5	14	41
44	8	3	41	3	9	47	3	34	18	1	15	0	5	20	26
45	8	12	6	3	13	1	3	38	3	1	16	15	5	26	5
46	8	20	22	3	16	12	3	41	45	1	17	29	5	31	39
47	8	28	28	3	19	18	3	45	22	1	18	42	5	37	6
48	8	36	25	3	22	21	3	48	55	1	19	53	5	42	27
49	8	44	12	3	25	20	3	52	23	1	21	3	5	47	42
50	8	51	50	3	28	15	3	55	48	1	22	11	5	52	50

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
51	8	59	17	3	31	6	3	59	8	1	23	17	5	57	52
52	9	6	35	3	33	53	4	2	24	1	24	22	6	2	48
53	9	13	43	3	36	37	4	5	35	1	25	26	6	7	36
54	9	20	40	3	39	16	4	8	42	1	26	27	6	12	18
55	9	27	27	3	41	51	4	11	44	1	27	28	6	16	53
56	9	34	4	3	44	23	4	14	41	1	28	26	6	21	21
57	9	40	30	3	46	50	4	17	34	1	29	23	6	25	43
58	9	46	46	3	49	13	4	20	23	1	30	19	6	29	57
59	9	52	51	3	51	32	4	23	6	1	31	12	6	34	4
60	9	58	46	3	53	46	4	25	45	1	32	5	6	38	4
61	10	4	29	3	55	57	4	28	19	1	32	55	6	41	57
62	10	10	2	3	58	3	4	30	48	1	33	44	6	45	42
63	10	15	24	4	0	6	4	33	12	1	34	31	6	49	20
64	10	20	34	4	2	3	4	35	31	1	35	17	6	52	51
65	10	25	34	4	3	57	4	37	45	1	36	1	6	56	14
66	10	30	22	4	5	46	4	39	55	1	36	43	6	59	30
67	10	34	59	4	7	31	4	41	59	1	37	23	7	2	38
68	10	39	25	4	9	12	4	43	58	1	38	2	7	5	38
69	10	43	40	4	10	48	4	45	52	1	38	39	7	8	31
70	10	47	43	4	12	20	4	47	41	1	39	15	7	11	16
71	10	51	34	4	13	48	4	49	25	1	39	49	7	13	53
72	10	55	14	4	15	11	4	51	4	1	40	21	7	16	23
73	10	58	42	4	16	30	4	52	37	1	40	51	7	18	44
74	11	1	59	4	17	44	4	54	6	1	41	20	7	20	58
75	11	5	4	4	18	54	4	55	29	1	41	47	7	23	4
76	11	7	57	4	19	59	4	56	47	1	42	12	7	25	2
77	11	10	39	4	21	0	4	57	59	1	42	35	7	26	51
78	11	13	8	4	21	57	4	59	6	1	42	57	7	28	33

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
79	11	15	26	4	22	49	5	0	8	1	43	17	7	30	7
80	11	17	32	4	23	36	5	1	5	1	43	35	7	31	33
81	11	19	26	4	24	19	5	1	56	1	43	52	7	32	50
82	11	21	8	4	24	58	5	2	42	1	44	7	7	34	0
83	11	22	38	4	25	32	5	3	22	1	44	20	7	35	1
84	11	23	56	4	26	1	5	3	57	1	44	31	7	35	54
85	11	25	2	4	26	26	5	4	27	1	44	41	7	36	39
86	11	25	57	4	26	47	5	4	51	1	44	49	7	37	16
87	11	26	39	4	27	2	5	5	10	1	44	55	7	37	45
88	11	27	9	4	27	14	5	5	24	1	44	59	7	38	6
89	11	27	27	4	27	21	5	5	32	1	45	2	7	38	18
90	11	27	33	4	27	23	5	5	35	1	45	3	7	38	22

Note :

(1) In the above table, the first column headed by ANOM, is the *bhuja* of the *mandakendra* i.e., the anomaly of a mean planet from its apogee (*mandocca*).

(2) D, M, S stand respectively for Degrees, Minutes and Seconds of arc.

(3) In the computations, *variable* periheries of the epicycles are adopted.

Appendix - 3

Śīghra Equations According to *Sūrya Siddhānta*

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	23	42	0	16	11	0	9	46	0	25	16	0	6	0
2	0	47	23	0	32	22	0	19	33	0	50	32	0	11	59
3	1	11	4	0	48	32	0	29	20	1	15	48	0	17	58
4	1	34	44	1	4	42	0	39	7	1	41	3	0	23	57
5	1	58	23	1	20	52	0	48	54	2	6	18	0	29	55
6	2	22	2	1	37	0	0	58	41	2	31	33	0	35	52
7	2	45	40	1	53	8	1	8	29	2	56	47	0	41	49
8	3	9	18	2	9	15	1	18	15	3	22	0	0	47	44
9	3	32	54	2	25	21	1	28	2	3	47	13	0	53	39
10	3	56	30	2	41	26	1	37	48	4	12	25	0	59	33
11	4	20	5	2	57	30	1	47	33	4	37	37	1	5	26
12	4	43	39	3	13	32	1	57	18	5	2	48	1	11	17
13	5	7	12	3	29	33	2	7	3	5	27	58	1	17	7
14	5	30	43	3	45	33	2	16	46	5	53	7	1	22	57
15	5	54	14	4	1	31	2	26	28	6	18	16	1	28	44
16	6	17	43	4	17	27	2	36	9	6	43	24	1	34	31
17	6	41	11	4	33	22	2	45	49	7	8	30	1	40	15
18	7	4	38	4	49	14	2	55	28	7	33	36	1	45	58
19	7	28	3	5	5	5	3	5	6	7	58	41	1	51	40
20	7	51	27	5	20	54	3	14	41	8	23	45	1	57	20
21	8	14	49	5	36	40	3	24	16	8	48	47	2	2	58
22	8	38	10	5	52	24	3	33	48	9	13	49	2	8	34
23	9	1	29	6	8	5	3	43	19	9	38	49	2	14	8

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
24	9	24	47	6	23	44	3	52	47	10	3	48	2	19	40
25	9	48	2	6	39	21	4	2	14	10	28	46	2	25	10
26	10	11	16	6	54	54	4	11	38	10	53	43	2	30	38
27	10	34	28	7	10	25	4	21	1	11	18	38	2	36	3
28	10	57	39	7	25	53	4	30	20	11	43	32	2	41	26
29	11	20	47	7	41	18	4	39	37	12	8	24	2	46	47
30	11	43	53	7	56	39	4	48	52	12	33	14	2	52	5
31	12	6	57	8	11	57	4	58	4	12	58	4	2	57	21
32	12	29	58	8	27	12	5	7	12	13	22	51	3	2	34
33	12	52	58	8	42	23	5	16	18	13	47	37	3	7	45
34	13	15	55	8	57	31	5	25	21	14	12	21	3	12	52
35	13	38	50	9	12	34	5	34	20	14	37	3	3	17	57
36	14	1	42	9	27	34	5	43	16	15	1	43	3	22	59
37	14	24	32	9	42	30	5	52	9	15	26	22	3	27	58
38	14	47	19	9	57	21	6	0	57	15	50	58	3	32	54
39	15	10	3	10	12	9	6	9	43	16	15	33	3	37	47
40	15	32	45	10	16	51	6	18	24	16	40	5	3	42	36
41	15	55	24	10	41	30	6	27	1	17	4	35	3	47	22
42	16	18	0	10	56	3	6	35	34	17	29	3	3	52	5
43	16	40	33	11	10	32	6	44	3	17	53	29	3	56	45
44	17	3	2	11	24	56	6	52	27	18	17	52	4	1	21
45	17	25	29	11	39	14	7	0	47	18	42	13	4	5	53
46	17	47	52	11	53	28	7	9	2	19	6	32	4	10	22
47	18	10	12	12	7	36	7	17	12	19	13	48	4	14	48
48	18	32	29	12	21	39	7	25	18	19	55	1	4	19	9
49	18	54	42	12	35	35	7	33	18	20	19	12	4	23	27
50	19	16	51	12	49	26	7	41	13	20	43	20	4	27	40
51	19	38	56	13	3	11	7	49	3	21	7	25	4	31	50

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
52	20	0	58	13	16	50	7	56	47	21	31	27	4	35	56
53	20	22	56	13	30	23	8	4	26	21	55	26	4	39	57
54	20	44	50	13	43	49	8	11	59	22	19	22	4	43	55
55	21	6	39	13	57	8	8	19	26	22	43	14	4	47	48
56	21	28	25	14	10	21	8	26	46	23	7	4	4	51	37
57	21	50	5	14	23	27	8	34	1	23	30	15	4	55	52
58	22	11	42	14	36	26	8	41	9	23	54	32	4	59	2
59	22	33	14	14	49	17	8	48	11	24	18	11	5	2	37
60	22	54	41	15	2	1	8	55	7	24	41	47	5	6	8
61	23	16	3	15	14	37	9	1	55	25	5	19	5	9	35
62	23	37	20	15	27	5	9	8	36	25	28	46	5	12	56
63	23	58	32	15	39	25	9	15	11	25	52	10	5	16	13
64	24	19	39	15	51	37	9	21	38	26	15	30	5	19	25
65	24	40	40	16	3	41	9	27	58	26	38	45	5	22	33
66	25	1	36	16	15	36	9	34	10	27	1	57	5	25	35
67	25	22	26	16	27	22	9	40	15	27	25	3	5	28	32
68	25	43	10	16	38	58	9	46	11	27	48	6	5	31	24
69	26	3	48	16	50	26	9	52	0	28	11	3	5	34	11
70	26	24	20	17	1	44	9	57	41	28	33	56	5	36	53
71	26	44	46	17	12	53	10	3	13	28	56	43	5	39	29
72	27	5	5	17	23	51	10	8	37	29	19	26	5	42	0
73	27	25	17	17	34	40	10	13	52	29	42	3	5	44	26
74	27	45	22	17	45	17	10	18	58	30	4	35	5	46	46
75	28	5	20	17	55	45	10	23	56	30	27	1	5	49	1
76	28	25	11	18	6	1	10	28	44	30	49	22	5	51	10
77	28	44	54	18	16	6	10	33	23	31	11	36	5	53	13
78	29	4	30	18	26	0	10	37	53	31	33	45	5	55	11
79	29	23	57	18	35	42	10	42	13	31	55	47	5	57	3

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
80	29	43	16	18	45	12	10	46	23	32	17	43	5	58	49
81	30	2	27	19	54	30	10	50	24	32	39	32	6	0	30
82	30	21	29	19	3	35	10	54	14	33	1	14	6	2	4
83	30	40	22	19	12	27	10	57	54	33	22	49	6	3	32
84	39	59	6	19	21	7	11	1	24	33	44	17	6	4	55
85	31	17	40	19	29	33	11	4	43	34	5	37	6	6	11
86	31	36	5	19	37	45	11	7	52	34	26	49	6	7	21
87	31	54	19	19	45	43	11	10	49	34	47	53	6	8	25
88	32	12	23	19	53	27	11	13	36	35	8	49	6	9	22
89	32	30	16	20	0	56	11	16	12	35	29	37	6	10	14
90	32	47	58	20	8	11	11	18	36	35	50	16	6	10	59
91	33	5	29	20	15	10	11	20	48	36	10	45	6	11	37
92	33	22	48	20	21	53	11	22	49	36	31	5	6	12	9
93	33	39	54	20	28	20	11	24	39	36	51	15	6	12	35
94	33	56	48	20	34	31	11	26	16	37	11	15	6	12	54
95	34	13	29	20	40	25	11	27	41	37	31	5	6	13	6
96	34	29	57	20	46	2	11	28	54	37	50	44	6	13	12
97	34	46	11	20	51	21	11	29	55	38	10	12	6	13	12
98	35	2	10	20	56	22	11	30	43	38	29	28	6	13	4
99	35	17	54	21	1	5	11	31	18	38	48	32	6	12	50
100	35	33	24	21	5	30	11	31	40	39	7	23	6	12	29
101	35	48	37	21	9	35	11	31	50	39	26	2	6	12	1
102	36	3	34	21	13	20	11	31	46	39	44	28	6	11	26
103	36	18	14	21	16	46	11	31	29	40	2	39	6	10	45
104	36	32	36	21	19	51	11	30	59	40	20	36	6	9	56
105	36	46	40	21	22	35	11	30	15	40	38	19	6	9	1
106	37	0	25	21	24	58	11	29	17	40	55	45	6	7	59
107	37	13	51	21	26	59	11	28	6	41	12	56	6	6	50

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
108	37	26	57	21	28	37	11	26	41	41	29	50	6	5	33
109	37	39	41	21	29	53	11	25	2	41	46	27	6	4	10
110	37	52	4	21	30	45	11	23	8	42	2	45	6	2	40
111	38	4	4	21	31	14	11	21	1	42	18	45	6	1	2
112	38	15	40	21	31	19	11	18	39	42	34	25	5	59	18
113	38	26	52	21	30	58	11	16	3	42	49	45	5	57	26
114	38	37	39	21	30	13	11	13	12	43	4	44	5	55	28
115	38	47	59	21	29	1	11	10	7	43	19	20	5	53	22
116	38	57	52	21	27	23	11	6	47	43	33	34	5	51	9
117	39	7	17	21	25	19	11	3	12	43	47	23	5	48	49
118	39	16	12	21	22	46	10	59	22	44	0	47	5	46	22
119	39	24	36	21	19	46	10	55	17	44	13	45	5	43	48
120	39	32	28	21	16	17	10	50	58	44	26	16	5	41	7
121	39	39	46	21	12	20	10	46	23	44	38	18	5	38	18
122	39	46	30	21	7	52	10	41	34	44	49	50	5	35	23
123	39	52	37	21	2	54	10	36	29	45	0	50	5	32	21
124	39	58	7	20	57	26	10	31	10	45	11	18	5	29	11
125	40	2	57	20	51	26	10	25	35	45	21	11	5	25	55
126	40	7	6	20	44	54	10	19	45	45	30	29	5	22	31
127	40	10	32	20	37	50	10	13	40	45	39	8	5	19	1
128	40	13	12	20	30	13	10	7	20	45	47	7	5	15	23
129	40	15	6	20	22	2	10	0	45	45	54	25	5	11	39
130	40	16	11	20	13	17	9	53	55	46	0	59	5	7	48
131	40	16	25	20	3	57	9	46	49	46	6	46	5	3	50
132	40	15	44	19	54	2	9	39	29	46	11	45	4	59	45
133	40	14	8	19	43	32	9	31	54	46	15	53	4	55	34
134	40	11	32	19	32	25	9	24	4	46	19	6	4	51	15
135	40	7	56	19	20	41	9	16	0	46	21	23	4	46	51

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
136	40	3	14	19	8	21	9	7	40	46	22	53	4	42	19
137	39	57	25	18	55	22	8	59	7	46	22	53	4	37	41
138	39	50	25	18	41	46	8	50	18	46	21	59	4	32	57
139	39	42	11	18	27	31	8	41	16	46	19	54	4	28	6
140	39	32	38	18	12	37	8	31	59	46	16	34	4	23	9
141	39	21	44	17	57	4	8	22	28	46	11	54	4	18	5
142	39	9	24	17	40	51	8	12	44	46	5	50	4	12	56
143	38	55	34	17	23	59	8	2	46	45	58	16	4	7	40
144	38	40	10	17	6	26	7	52	34	45	49	8	4	2	19
145	38	23	6	16	48	13	7	42	10	45	38	18	3	56	51
146	38	4	18	16	29	20	7	31	32	45	25	41	3	51	18
147	37	43	41	16	9	46	7	20	41	45	11	10	3	45	39
148	37	21	9	15	49	31	7	9	38	44	54	38	3	39	54
149	36	56	36	15	28	36	6	58	22	44	35	56	3	34	4
150	36	29	57	15	7	0	6	46	55	44	14	56	3	28	9
151	36	1	6	14	44	43	6	35	16	43	51	29	3	22	8
152	35	29	56	14	21	46	6	23	25	43	25	26	3	16	2
153	34	56	20	13	58	9	6	11	23	42	56	35	3	9	51
154	34	20	13	13	33	52	5	59	11	42	24	46	3	3	35
155	33	41	26	13	8	56	5	46	48	41	49	46	2	57	14
156	32	59	53	12	43	21	5	34	14	41	11	23	2	50	49
157	32	15	27	12	17	8	5	21	31	40	29	24	2	44	19
158	31	28	1	11	50	17	5	8	39	39	43	33	2	37	45
159	30	37	28	11	22	48	4	55	37	38	53	36	2	31	6
160	29	43	42	10	54	44	4	42	27	37	59	18	2	24	24
161	28	46	34	10	26	4	4	29	9	37	0	21	2	17	37
162	27	46	1	9	56	50	4	15	42	35	56	30	2	10	47

ANOM.	KUJA			BUDHA			GURU			ŚUKRA			ŚANI		
DEG.	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
163	26	41	55	9	27	3	4	2	9	34	47	26	2	3	53
164	25	34	14	8	56	43	3	48	28	33	32	54	1	56	55
165	24	22	52	8	25	53	3	34	41	32	12	36	1	49	54
166	23	7	47	7	54	33	3	20	47	30	46	16	1	42	50
167	21	48	58	7	22	45	3	6	48	29	13	41	1	35	44
168	20	26	27	6	50	30	2	52	44	27	34	38	1	28	34
169	19	0	14	6	17	51	2	38	35	25	48	58	1	21	21
170	17	30	25	5	44	48	2	24	22	23	56	36	1	14	6
171	15	57	6	5	11	24	2	10	5	21	57	30	1	6	49
172	14	20	27	4	37	40	1	55	44	19	51	47	0	59	30
173	12	40	40	4	3	38	1	41	21	17	39	38	0	52	8
174	10	57	59	3	29	21	1	26	56	15	21	23	0	44	45
175	9	12	42	2	54	50	1	12	28	12	57	31	0	37	20
176	7	25	8	2	20	6	0	57	59	10	28	38	0	29	54
177	5	35	40	1	45	14	0	43	30	7	55	30	0	22	27
178	3	44	41	1	10	14	0	28	59	5	19	0	0	14	59
179	1	52	39	0	35	8	0	14	29	2	40	9	0	7	30
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - 4

List of 27 Yogas

1. *Viṣkambha*
2. *Prīti*
3. *Āyuṣmān*
4. *Saubhāgya*
5. *Śobhana*
6. *Atigaṇḍa*
7. *Sukarmā*
8. *Dhṛti*
9. *Śūla*
10. *Gaṇḍa*
11. *Vṛddhi*
12. *Dhruva*
13. *Vyāghāta*
14. *Harṣaṇa*
15. *Vajra*
16. *Siddhi*
17. *Vyatīpāta*
18. *Varīyān*
19. *Parigha*
20. *Śiva*
21. *Siddha*
22. *Sādhya*
23. *Śubha*
24. *Śukla*
25. *Brahma*
26. *Indra*
27. *Vaidhṛta*

Appendix – 5

Mandaphalas according to *KK* – A Comparison

Example 1: For the **sun**, multiply $R_1 \sin(m)$ by 10 and divide by 550 to get *manda phala* in degrees. With $R_1 = 120$ and $R_2 = 360$, we have for the maximum *mandaphala*:

$$\frac{a}{R_2} = \frac{120 \times 10}{550} \qquad \therefore\ a = \frac{360 \times 120 \times 10}{550} = 785'.4545 = 13^0 05' 28''$$

$\therefore$ Maximum *mandaphala* $= \dfrac{a^0}{2\pi} = 2^0 5' 1''$

Modern value $= 2e - \dfrac{e^3}{4}$ (in radian),

the coefft. of the leading term in the equation of centre

where e = eccentricity of the earth's orbit given by 0.01675104.

$\therefore$ Maximum *mandaphala* (equation of centre) = $1^0$55'10".

Example 2: For the **moon**, $e = 0.0549$.

$$\therefore \left(2e - \frac{e^3}{4}\right) \times \frac{180}{\pi} = 6^0 17' 19''.34$$

Accordingly the radius of the moon's *manda* periphery a = $30^0$15'7".56

According to *KK*,

Maximum *mandaphala* (with $m = 90^0$):

$$\frac{R_1 \sin m \times 10}{238} = \frac{120 \times 10}{238} = 5^0 2' 31''.26$$

Table: Manda peripheries and max. mandaphala

Sl. No.	Bodies	Denominator (*Hāra*)	Periphery (*a*)	Maximum Equation of Centre	
				KK	Modern
1.	Ravi	550	$13^0 5' 28''$	$2^0 5' 1''$	$1^0 55' 10''$
2.	Candra	238	$30^0 15' 7''.56$	$6^0 17' 19''.34$	$5^0 2' 31''.26$
3.	Kuja	107	$67^0 17' 23''$	$10^0 42' 34''.17$	$10^0 41' 24''.14$
4.	Budha	198	$36^0 21' 49''$	$5^0 47' 15''$	$23^0 26' 24''$
5.	Guru	228	$31^0 34' 44''$	$5^0 1' 33''.4$	$5^0 32' 3''.49$
6.	Śukra	784	$9^0 11' 1''.22$	$1^0 27' 42''$	$0^0 46' 36''.93$
7.	Śani	157	$45^0 51' 36''$	$7^0 17' 56''$	$6^0 13' 3''.86$

Note:

Eccentricities for Kuja, Budha, Guru, Śukra and Śani are taken respectively as 0.09339, 0.20564, 0.04831, 0.00678, 0.05428.

Remark: We observe a substantial departure of Budha's *siddhantic* parameters from the modern ones. This is because of the high eccentricity of Budha's orbit. In fact among the earlier known planets (i.e. omitting Pluto) Budha's orbit has the largest eccentricity. Such being the case, the *siddhantic* value for the periphery of Budha's *manda* epicycle is very inadequate.

It is interesting to note that the famous Kerala astronomer, Nīlakaṇ-ha Somayāji (b. 1444) recommended a much higher periphery viz. 60^0 for Budha's *manda* epicycle. However, based on the modern known value of the eccentricity of Mercury's orbit, we propose a variable periphery between $109^0.8002$ and $184^0.7194$. This results in the maximum equation of centre (for the *manda* anomaly $m = 90^0$) as $29^0.399022$ by considering still higher powers of the eccentricity *e*.

Appendix – 6

Mean Positions at the *KK* epoch (24-2-1183 (J) AD) – A Comparison

Text → **Body ↓**	**Modern** **(*Sāyana*)**	**Modern** **(*Nirayaṇa*)**	***Karaṇa kutūhalam*** **(*Nirayaṇa*)**	***Sūryasiddhānta*** **(*Nirayaṇa*)**
Candra	339° – 35′ – 21″	327° – 07′ – 12″	329° – 05′ – 50″	328° 08′ 16″
Mandocca	146° – 52′ – 41″	134° – 24′ – 32″	135° – 12′ – 59″	134° 58′ 01″
Anom (*MK*)	192° – 42′ – 41″	192° – 42′ – 41″	193° – 52′ – 51″	193° 10′ 15″
Ravi	340° – 01′ – 19″	327° – 33′ – 10″	329° – 13′ – 00″	329° 18′ 32″
Mandocca	88° – 54′ – 41″	76° – 26′ – 32″	78° – 0′ – 0″	77° 16′ 05″
Anom (*MK*)	251° – 06′ – 38″	251° – 06′ – 38″	251° – 13′ – 0″	252° 02′ 27″
Rāhu	83° – 24′ – 47″	70° – 56′ – 38″	72° – 34′ – 51″	72° 41′ 20″
Kuja	242° – 45′ – 26″	230° – 17′ – 17″	231° – 24′ – 21″	232° 36′ 06″
Budha	82° – 22′ – 52″	69° – 54′ – 43″	*81° – 14′ – 30″	*82° 35′ 08″
Śukra	267° – 0′ – 28″	254° – 32′ – 19″	**258° – 05′ – 55″	**258° 16′ 18″
Guru	82° – 37′ – 15″	70° – 09′ – 06″	64° – 00′ – 51″	63° 56′ 21″
Śani	145° – 31′ – 35″	133° – 03′ – 26″	123° – 43′ – 17″	123° 43′ 51″

Note:
(1) *Ayanāṃśa* : $12^0 28' 09''$ for modern (*nirayaṇa*); (2) * *Budha Śīghrocca,* ** *Śukra Śīghrocca*; (3) *Kali* days elapsed: 15,64,737; (4) The *ayanāṃśa* for the epoch as per *KK* is 11^0 while according to the recommendations of the Calendar Reform Committee Report, it comes to about 12°28′09″ Therefore, subtracting the difference 1°28′09″ from the *KK* epochal mean positions of the bodies, we get them still closer to the modern ones.

Appendix – 7

Śrīmad Bhāskarācārya praṇītaṃ

Karaṇakutūhalaṃ

Madhyamādhikāraḥ – 1

maṅgalācaraṇam –

gaṇeśaṃ giraṃ padmajanmācyuteśān
grahānbhāskaro bhāskarādīmśca natvā |
laghuprakriyaṃ prasphu-aṃ khe-akarma
pravakṣyāmyahaṃ brahmasiddhāntatulyam ||1||

ahargaṇasādhanam –

śakaḥ pañcadikcandrahīno'rkanighno
madhoryātamāsānvito'dho dvinighnāt |
rasāṅgānvitātsvābhrakhāṅkāṃśahīnāccharāṅgair
avāptādhimāsairyugūrdhvaḥ ||2||

kharāmāhato yātatithyanvito'dhastriyuktāt
kharāmābhraśailāṃśayuktāt |
yugāṅgairavāptāvamonastadūrdhvo
bhavejjīvavārādiko'hargaṇo'yam ||3||

kṣepakāḥ –

diśo go yamā viśvatulyāḥ khamarke
vidhau khendavo'ṅkāśvinaḥ pañcakhākṣāḥ ||
vidhūcce'bdhayo'kṣendavo'rkā navākṣā
navātyaṣ-itatvā grahāścandrapāte ||4||

kuje'śvāḥ kudasrā jināḥ kvakṣitulyā
budhe dvau kunetrāṇi śakrāḥ kharāmāḥ ||
gurau kṣepako dvau kṛtāḥ khaṅkubāṇāḥ
site'ṣ-au dhṛtirmārgaṇāḥ pañcabāṇāḥ ||5||

yugānyagnayastryabdhayaḥ śailacandrāḥ
śanau ceti rāśyādinā kṣepakeṇa |
dhyupiṇḍotthakhe-o yutaḥ svena madhyo
bhavedudgame'rkasya laṅkānagaryyām ||6||

madhyama sūryabudhaśukrāṇām sādhanaṃ –

ahargaṇo viśvaguṇastrikhāṅkair bhaktaḥ
phalono dyugaṇo lavādyāḥ |
ravijñaśukrāḥ syur athābdavṛndād
vedāṅgalabdhena kalādinonāḥ ||7||

madhyama candrānayanam –

ahnāṃ gaṇaḥ śakraguṇo vihīnaḥ
svātyaṣ-i bhāgena lavādirinduḥ |
ahargaṇātkhābhrarasāṣ-abhaktādāptena
bhāgādiphalena hīnaḥ ||8||

uccānayanam –

gaṇo dvidhā gobhirinābhravedair labdhaikyam
amśādi bhaved vidhūccaṃ |

pātānayanam –

dvidhāṅkacandraiḥ khakhabhairdinaughād
āptāṃśayogo bhavatīndupātaḥ ||9||

bhauma budhaśīghroccānayanam –

rūdraghno dyucayo dvidhā śaśiyamair vedābdhisiddheṣubhir
bhakto'ṃśādiphaladvayaṃ tu sahitaṃ syānmedinīnandanaḥ |
vedaghno dyucayaḥ svakīyadahanābdhyaṃśena yukto bhaved
bhāgādikṣvacalaṃ gaṇātkṣitiyamendrāptāṃśakair
varjitam ||10||

gurorānayanam –

gaṇo dvidhārkair bhayamābdhibhiśca
bhaktaḥ phalāmśāntaram indramantrī |

śukraśīghroccānayanam –

nṛpāhatohnāṃ nicayo dvidhāsau
bhūbāṇavedādribhir abhracandraiḥ ||11||
bhakto lavādyaṃ phalayor yadaikyaṃ
tajjāyate daityaguroścaloccam |

śanerānayanam –

bhakto'bhrarāmais turagāṅgarāmanandair
dvidhāṃśādiphalaikyam ārkiḥ ||12||

grahāṇāṃ madhyamā gatiḥ –

nandākṣā bhujagā raveḥ śaśigatiḥ khāṅkādrayo'kṣāgnayas
tuṅgasyāṅgakalāḥ kuvedavikalāḥ pātasya rāmā bhavāḥ |
māheyasya mahīguṇā rasayamākṣasyeṣusiddhā radāḥ
pañcejyasya sitasya ṣaṇṇavamitāścāṣ-au śanerdve kale ||13||

bhūmadhyarekhāmāha (rekhāpurāṇi) –

purī rakṣasāṃ devakanyāthakāñcī
sitaḥ parvataḥ paryyalīvatsagulmaṃ |
purī cojjayinyāhvayā gargarā-aṃ
kurukṣetrameru bhuvo madhyarekhā ||14||

deśāntara saṃskāra vidhiḥ –

rekhā svadeśāntara yojanaghnī
gatirgrahasyābhragajair vibhaktā |
labdhā viliptā khacare vidheyā prācyām ṛṇaṃ
paścimato dhanaṃ tāḥ ||15||

grahāṇāṃ bījasaṃskāraḥ –

abdā gajāśvaistrirasaivibhājitā ṛṇaṃ
viliptāsu śaśījyayoḥ kramāt |
viśvaiḥ kharāmair dviyamaiśca khecaraiḥ
pātoccasaumyāsphujitāṃ dhanaṃ tathā ||16||

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Spaṣ-ādhikāraḥ – 2

mandoccam –

mandoccamarkasya gajādribhāgā
bhaumādikānāṃ sadalāṣ-sūryāḥ |
tattvāśvinaḥ sārddhayamādricandrāḥ
kvaṣ-au śaśāṅkāṅgayamāḥ krameṇa ||1||

śīghroccāḥ –

kukuñjarā vedakṛtāstridasrāḥ
saptāhayo viśvamitāḥ parākhyāḥ |
bhaumādikānām atha madhyamo'rkaḥ
śīghroccamijyāraśanaiścarāṇām ||2||

mandaśīghrakendrayoḥ dhanarṇatvam –

grahonamuccaṃ mṛdu cañcalaṃ ca
kendre bhavetāṃ mṛducañcalākhye |

tribhistribhirbhaiḥ padamatra kalpyaṃ
svarṇaṃ phalaṃ meṣatulādikendre ||3||

bhujako-yānayanam –

tryūnam bhujaḥ syāt tryadhikenahīnam
bhārdham ca bhārdhādhikam vibhārdham |
navādhikenonitaṃ arkabhaṃ ca bhavecca
ko-istrigṛhaṃ bhujonaṃ ||4||

bhaumādīnāṃ mandoccaspaṣ-īkaraṇm –

bhaumāśukendre padayātagamyasvalpsya
liptāḥ khakhavedabhaktāḥ |
labdhāmśakaiḥ karkamṛgādikendre
hīnānvitaṃ spaṣ-amasṛgmṛdūccam ||5||
labdhāmśakānāṃ trilavena hīnaḥ spaṣ-aḥ
paraḥ syāt kṣitinandanasya ||5 ½ ||

jyā sādhanam –

rūpāśvinau viṃśatiraṅkacandrā
atyaṣ-itithyarkanaveṣudasrāḥ ||6||
jyākhaṇḍakānyaṃśamiterdaśāptaṃ
syurbhuktakhaṇḍānyatha bhogyanighnāḥ |
śeṣāmśakāḥ khenduhṛtā yadāptaṃ
tadbhuktakhaṇḍaikyayutaṃ bhavejjyā ||7||

dhanuḥ karaṇam –

viśodhya khaṇḍāni daśaghnaśeṣād
aśuddhalabdhaṃ dhanuramśakādyam |
viśuddhasaṅkhyāhatadigyutaṃ
syād vyastair dalair vyastadhanurjyake staḥ ||8||

mandaphala sādhanam –

sūryādikānāṃ mṛdukendradorjyā digghnī
vibhājyātha khapañcabāṇaiḥ |
nāgāgnidasrair giripūrṇacandrair vasvaṅka
bhūbhir vasunetranetraiḥ ||9||

yugāṣ-aśailair munipañcacandraiḥ phalaṃ
lavāḥ kendravaśād dhanarṇam |
kāryaṃ grahe sūryavidhū sphu-au stau
mandasphu-ākhyā itare syurevaṃ ||10||

madhyamārkodayāt sphu-odayakaraṇaṃ –

bhānoḥ phalaṃ bhairvihṛtaṃ ca candre
madhye vidheyaṃ ravivad dhanarṇaṃ ||10 ½ ||

sūryādīnāṃ gatiphalaṃ –

svabhogyakhaṇḍaṃ navahṛtkharāmśor
viśvāhataṃ vedahṛtaṃ himāmśoḥ ||11||

dvighnaṃ nagāptaṃ kujasaumyayośca
khākṣairinaiḥ khārkamitaiśca bhaktam |
jīvādikānāṃ ca gateḥ phalaṃ tatsvarṇaṃ
kramāt karkamṛgādikendre ||12||

bhaumādīnāṃ śīghraphalasādhanam –

ko-ijyā calakendrajā paraguṇā dvighnī tathonānvitā,
kendrekarkamṛgādike parakṛtiḥ khābhrābdhiśakrairyutā |
tanmūlaṃ śravaṇaḥ pareṇa guṇitā dorjyātha karṇoddhṛtā,
taccāyaṃ capalaṃ phalaṃ dhanamṛṇaṃ mandasphu-e
syātsphu-aḥ ||13||

bhaumsya sphu-agatijñānam –

tadutthamādyena calena madhyaścet
saṃskṛtaḥ spaṣ-atarastadā syāt |
dalīkṛtābhyāṃ prathamaṃ phalābhyāṃ
tato'khilābhyām asakṛtkujastu ||14||

gatispaṣ-īkaraṇam –

gateḥ phalenaivatu saṃskṛtā yā
madhyā gatirmandagatir bhavetsā |
grahasya mandasphu-abhuktir varjitā
svāsīghrakendrasya gatirbhaṃvetsā ||15||

drākkendrabhuktir guṇitāśu
cāpabhogajyayā khābdhi guṇā ca bhaktā |
saptaghnakaraṇena caloccabhukteḥ
śodhyā viśeṣā sphu-akhe-abhuktiḥ ||16||

svaśīghroccasame grahe spaṣ-ā
śīghragatiḥ paramocyate ||16 ½ ||

ayanāṃśānayanaṃ –

athāyanāmśāḥ karaṇābdaliptā yuktā
bhavāstadyuta madhyabhānoḥ ||17||

udayāntaramāha –

dvighnsya dorjyāśarahṛdviliptā
bhānorvidhoḥ kvakṣihṛtāḥ kalāstāḥ |
svarṇaṃ ca yugmau jayadasthite'rke
krameṇa karmetyudayāntarākhyam ||18||

carakarma –

ayanalavadinaiḥ prāṅmeṣa saṅkrāntikālād-
bhavati divasamadhye yākṣabhākṣaprabhā sā |
daśa gaja daśa nighnī sākṣabhāntyā tribhaktā
pratigṛhacarakhaṇḍānyāyanāmśāḍhya bhānoḥ ||19||
bhujagṛhamitayogo bhogya khaṇḍāmśa ghātāt
khaguṇalavayuga svaṃ svaṃ caraṃ golayoḥ syāt |
carapala gatighātaḥ ṣaṣ-ibhakto viliptāḥ
svamṛṇam udayakāle vyastam astagraheṣu ||20||

tithi-karaṇa-nakṣtra-yoga-sādhanam –

viravicandralavāraviṣaḍ hṛtāḥ
pṛthagitāstithayaḥ karaṇāni ca |
kurahitāni bavācchakuniprabhṛtyasita
bhūtadalādi catuṣ-ayam ||21||

grahalāḥ saravīndukalāhṛtāḥ
khakhagajaiścabhayogamito kramāt ||
atha hṛtāḥ svagataiṣyaviliptikāḥ
svagatibhiśca gatāgatanāḍikāḥ ||22||

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Tripraśnādhikāraḥ - 3

svadeśodaya sādhanaṃ lagna sādhanañca –

laṅkodayā nāgaturaṅgadasrā go'ṅka
aśvino rāmaradā vināḍyaḥ |
kramotkramasthāś carakhaṇḍakaiḥ svaiḥ
kramotkramasthaiśca vihīnayuktāḥ || 1||

meṣādiṣaṇṇāmudayāḥ svadeśe
tulādito'mī ca ṣaḍutkramasthāḥ |
tātkāliko'rko'yanabhāgayuktastad
bhogya bhāgairudayo hataḥ svaḥ ||2||

khāgnyuddhṛtastaṃ ravibhogyakālaṃ
viśodhayediṣ-aghatīpalebhyaḥ ||
tadagrato rāśyudayaṃśca śeṣamaśuddha
hṛtkhāgniguṇaṃ lavādyam ||3||

aśuddhapūrvair bhavanair ajādyair yuktaṃ
tanuḥ syād ayanāṃśahīnam |
bhogyālpakāle khaguṇāhato'rkaḥ
svīyodayāptāmśayuto vilagnam ||4||

lagnād iṣ-akālānayanam –

arkasya bhogyastanubhuktayukto
madhyodayāḍhyaḥ samayo vilagnāt |
yadaikabhe lagnaravī tadaitadbhāga
antaraghnodaya khāgnibhaktaḥ ||5||
syād iṣ-akālo yadi lagnamūnaṃ śodhyo
dyurātrādathavā rajanyāḥ |
rātrīṣ-akāle tu saṣaḍgasūryāllagnaṃ
tato'yuktavad iṣ-akālaḥ ||6||

natonnata sādhanam –

carapalayutahīnā nāḍikāḥ pañcacandrā
dyudalamatha niśārdhaṃ yāmyagole vilomam |
dyudalagata gha-īnām antaraṃ tannataṃ
syān natarahita dinārdhañconnatañ jāyate'tra ||7||

iṣ-akālāc chāyānayanaṃ chāyāyā iṣ-akālānayanañ ca –

dinadalaṃ viśaraṃ khaharo
bhavennatakṛtiḥ pṛthagabhraśarā hatāḥ |
khakhanavāḍhya pṛthaksthitayā hṛtāḥ
khaharataḥ patito'bhimato haraḥ ||8||

atha nataṃ yadi pañcadaśādhikaṃ
dinadalātpatitaṃ sa harastadā |
prathamakhaṇḍahṛtaṃ dalitaṃ caraṃ
svaguṇitaṃ svaṣaḍaṃśa vivarjitam ||9||

daśayutaṃ palakarṇahataṃ
hṛtirharahatā śravaṇo'ṅgulapūrvakaḥ |
raviyutonita karṇahateḥ padaṃ
dyutir inadyuti vargayuteḥ śrutiḥ ||10||

śrutivibhaktahṛtistu haro bhavet sa
patitaḥ khaharādavaśeṣakam |
pṛthagidaṃ khakhanandahataṃ
harāt khaviṣayair avaśeṣa vivarjitaiḥ ||11||

phalapadaṃ hi nataṃ yadi śeṣakaṃ
digadhikaṃ hara eva tadonnatam |
iti kṛtaṃ laghu kārmuka śiñjinī grahaṇakarma
vinā dyutisādhanam ||12||

krāntikhaṇḍavaśāt krāntisādhanam –

syuḥ krāntikhaṇḍāni yamāṅgarāmāḥ
kvabdhyagnayo gonavabāhavaśca |
ṣaḍaśvinaḥ kheṣubhuvo dvibāṇā
yuktāyanāṃśa grahabāhu bhāgāḥ ||13||

tithyuddhṛtā labdhamitāni tāni
yojyāni bhogyāhata śeṣakasya |
tithyamśakaiḥ krāntikalābhavanti
yuktāyanāṃśa grahagoladikkāḥ ||14||

prakārāntareṇa krāntisādhanam –

bhujāṃśonanighnāḥ khanāgendavas tannaga
aśvāmśahīnais trivedābdhibhis te |
kalāṣ-ādaśonair vibhaktā lavādir bhavet
krāntir evaṃ vinā khaṇḍakair vā ||15||

akṣāmśa sādhanam –

daśābdhyanvitā'kṣaprabhā ṣaṣ-ibhāgo'kṣa
karṇānvitastena bhaktā prabhā sā |
khanandāhatā dakṣiṇāḥ syuḥ palāmśāḥ
palaḥ samskṛtaḥ krāntibhāgair natāmśāḥ ||16||

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Candragrahaṇādhikāraḥ – 4

nata sādhanam –

natavihīna hataiḥ khaguṇair hṛtāḥ
khaśarabhānubhuvo daśavarjitāḥ |
raviharaḥ savidhor vidaśāmśako
nijaphalaṃ nijahārahṛtaṃ kramāt ||1||

dhanamṛṇaṃ parapūrvanate ravau
śaśini pūrvanate svamṛṇe phale |
itarathobhayato'pi phalakṣayaḥ
sphu-atarau grahaṇe'tha tatastithiḥ ||2||

iti nataṃ kṛmamaurvikayoditaṃ
kramajameva hi jiṣṇuja sammatam |
yadaparaiḥ kṛtam utkramajīvayā
valanadṛṅ natakarma na tanmatam ||3||

tātkālika grahasādhanam –

yātaiṣyanāḍīguṇitā dyubhuktiḥ
ṣaṣ-yāhṛtā tadrahito yutaśca |
tātkālikaḥ syātsvacaraḥ śaśīnau
parvānta evaṃ samaliptakau staḥ ||4||

śara sādhanam –

sapāta tātkālika candradorjyā
trighnī kṛtāptā ca śaro'ṅgulādiḥ |
sapātaśīta dyutigoladiksyān meṣādi
ṣaḍbhaṃ khalu saumyagolaḥ ||5||

ayanajñānaṃ prakārāntareṇa śarānayanañca –

yāmyo'paraṃ karkamṛgādiṣa-ke
te cāyana dakṣiṇasāmyakastaḥ |
khāśvāḥ śarāṅgāni raseṣavo'gni
vedāśca dhiṣṇyāni khagāḥ śarasya ||6||
khaṇḍāni taiḥ krāntivadatra sādhyo
bāṇaḥ kalādistrihṛto'ṅgulādiḥ |

candra-sūrya-bhūbhā bimba sādhanam –

bimbaṃ vidhoḥ syāt svagatir yugādri bhaktā
raverdasrahatā śivāptā ||7||
trighnīndu bhuktis turagāṅgabhaktā
bhūbhārka bhuktyadri lavenahīnā |

rāhuḥ kubhāmaṇḍalagaḥ śaśāṅkaṃ
śaśāṅkagaś chādayatīnabimbam ||8||

grāsamāna sādhanam –

yacchādya sañchādaka maṇḍalaikya khaṇḍaṃ
śaronaṃ sthagitaṃ tadāhuḥ |
channaṃ punaścchādya vivarjitaṃ
tatkhacchannam etan nikhilagrahe syāt ||9||

sthiti-vimarda-gha-yorānayanam –

dvighnāccharac channayutāhatāt padaṃ
khāṣ-endunighnaṃ vivareṇa gatyoh |
bhaktaṃ sthitiḥ syād dha-ikādirevaṃ
khacchannato mardamapi prajāyate ||10||

pañcakāla sādhanam –

vikṣepato nāgayugairvibhaktā
nāḍyādikaṃ yatphalamatra labdham |
dviṣ-hā sthitistena yutā vihīnā
syātāṃ kramāt spārśika mokṣake te ||11||

oje pade pātayuto vidhuśced
yugme'nyathaivaṃ sthitivad vimarde |
sūryodayād astamayācca gamyo
madhyo grahaḥ parvavirāmakāle ||12||

sthityā vimardena ca varjite'sminstaḥ
sparśasammīlanake krameṇa |
yukte'tha tasmin sthitimardakābhyāṃ
muktis tathonmīlanakaṃ nijābhyām ||13||

valanānayanam –

khāṅkāhataṃ svadyudalena bhaktaṃ
sparśe vimuktau ca nataṃ lavāḥ syuḥ |
tajjyāhatāścākṣalavā vibhaktās
tribhajyayā prāgapare nate syāt ||14||
saumyāntakāśā valanaṃ grahasya
yuktāyanāmśasya tu ko-ijīvā |
bāṇair vibhaktāyanadik tathānyad
bhāgādyamekānyadiśostayostu ||15||
yogāntara jyāhatamānayoga khaṇḍaṃ
tribhajyāhṛtam aṅgulādyam |
sphu-aṃ bhavet tadvalanaṃ ravīndvoḥ
prāg grāsa mokṣe viparītadikke ||16||

spārśika-maukṣika-śara sādhanam –

mādhyaḥ śarastvojapadodbhdavaścet
sthityagni bhāgonayuto yutonaḥ |
yugme vidhorvā prathamāntyabāṇau
candragrahe vyastadiśaḥ śarāḥ syuḥ ||17||

parilekha kathanam –

grāhyārdhasūtreṇa vidhāya vṛttaṃ
mānaikyakhaṇḍena ca sādhitāśam |
bāhye'tra vṛtte valanaṃ yathāśaṃ
prākspārśikaṃ paścimataśca mokṣam ||18||

deyaṃ raveḥ paścimapūrvataste jyāvacca
bāṇau valanāgrakābhyām |
utpādya matsyaṃ valanāgrakābhyāṃ
mādhyaḥ śarastanmukha pucchasūtre ||19||

sparśa-madhya-mokṣasthāna kathanam –

kendrād yathāśaṃ svaśarāgrakebhyo
vṛttaiḥ kṛtair grāhaka khaṇḍakena |
syuḥ sparśa madhya graha mokṣa samsthā
athāṅkayen madhyaśarāgracinhāt ||20||

iṣ-a-grāsa-kathanam –

ādyantya bāṇāgragate ca rekhe
jñeyāvimau pragraha mukti mārgau |
mānāntarārdhena vilikhya vṛttaṃ
kendre'tha tanmārgayuta dvaye'pi ||21||

bhūbhārdhasūtreṇa vidhāya vṛtte
sammīlanonmīlanake ca vedye |
mārgapramāṇe vigaṇayya pūrvaṃ
mārgāṅgulaghnaṃ sthitibhaktamiṣ-am ||22||

iṣ-āṅgulāni syuratha svamārge
dadyād amūniṣ-avaśāt tadagre |
vṛtte kṛte grāhakakhaṇḍakena
syād iṣ-akāle grahaṇasya saṃsthā ||23||

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Sūryagrahaṇādhikāraḥ – 5

natonnatayoḥ svarūpam –

darśāntakāle tribhahīnalagnaṃ kāryaṃ
ca tatkrānti palāntaraikyam |
bhinnaikadiktve natabhāgakāḥ syuḥ
khāṅkacyutāste punar unnatāmśāḥ ||1||

lambana-natyoḥ sādhanam –

tribhonalagnārka viśeṣa śiñjinī
kharāmabhaktā gha-ikādi lambanam |
tadunnanatajyā nihataṃ nakhendubhir hṛtaṃ
sphu-aṃ syātsvamṛṇaṃ tithau kramāt ||2||

tribhonalagnādhika hīnake
ravestato'sakṛllagna vilambanādikam |
natāmśa jīvārka lavānvitāṣ-ahṛn
natāṃśadik cāṅgulapūrvakā natiḥ ||3||

prakārāntareṇa lambana sādhanam –

saptādrayaḥ kumanavo'ṣ-adhṛtī navendudasrāḥ
śaratriyamalāḥ khanijāśca piṇḍāḥ |
ṣa- tryaśvino jinayamā dviśatī tribhona
lagnārkayor vivarabhāgamiter bhavāptāḥ ||4||
piṇḍo gatastvagata yātaviyoga nighna
śeṣeśabhāga rahitaḥ sahitaśca bhogye |
ūnādhike kharasahṛt khalu lambanaṃ vā
prāgvat sphu-aḥ sakṛdato natir anyalagnāt ||5||

sthityādi sādhanam –

spaṣ-o'tra bāṇo nati saṃskṛtaḥ syācchannaṃ
tataḥ prāgvadataḥ sthitiśca |
sthityonayuktād gaṇitāgatācca
tithyantato lambanakaṃ pṛthakstham ||6||

svarṇaṃ ca tasminpravidhāya sādhyas
tātkālikaḥ spaṣ-aśaraḥ sthitiśca |

tayonayukte gaṇitāgate tatsvarṇaṃ
pṛthaksthaṃ muhurevametau ||7||

sparśa-mokṣayoḥ sādhanam –

syātāṃ sphu-au pragrahamuktikālau
sakṛtkṛte lambanake sakṛtsnaḥ |
tanmadhya kālāntarage sthitī sphu-e
śeṣaṃ śaśāṅka grahaṇoktam atra hi ||8||

grahaṇe ravicandrayoḥ varṇa jñānam –

arkāmśako'rkasya vidhor nṛpāmśo
nādeśanīyaḥ khalu khaṇḍito'pi |
alpārdha sarvagrahaṇe śaśī
syād dhūmro'sito babhrur inastu kṛṣṇaḥ ||9||

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Udayāstādhikāraḥ – 6

guroḥ udayāsta sādhanam –

iṣ-o'hnāṃ nicayo'bda diglavayutaḥ pañcābhra bhūvarjito
bhakto nandanavāgnibhis tithimitaiḥ śeṣair gurorudgamaḥ |
asto vedagajāgnibhis tadadhikair ūnair gataiṣyaisdinais
tātkālārka gha-īphalaṃ ca tithivat sūryāhataṃ śeṣakaiḥ ||1||

rāśibhyām udaye yutād dinakarād aste tribhiḥ saṃyutād
vaccoktārka gha-īphalaṃ ca khaguṇaiḥ sūkṣmaṃ dhanarṇaṃ
tathā |
saṅkrānter udayāt khakhāgnirahitāt tithyāhatāt svodayena
āptaṃ tacca gurūdaye dhanamṛṇaṃ cāste tu tatsaptamāt ||2||

śukrasyodayāsta sādhanam –

pañceśona gaṇo'bdabhūpalavayug vedāṣ-abāṇair hṛtaḥ
paścāt ṣa-kṛtibhir nagāṣ-ayugalaiḥ śukrodayāstau kramāt |
śeṣaiḥ prāg nagagoyamair gajayugaprāṇais tadānīṃ ca yas
tigmāṃśor udayaḥ khakhāgnirahitaḥ paścāttu tatsaptamaḥ
||3||

kṣuṇṇaḥpañcaguṇaiḥ śariaśca viṣayairṅgāgnisaṃkhyaiḥ kramād
bhaktastena ca bhodayena phalayuk prākcheṣakair udgamaḥ |
jñeyaścāstamayaḥ phalena rahitaiḥ śodhyaṃ na śudhyed yadā
kāryaṃ vyastaviśodhanaṃ dhanamṛṇaṃ vyastaṃ taduktaṃ tadā
||4||

śīghrakendrāṃśebhyo vakrādi sādhanam –

drākkendrabhāgais trinṛpaiḥ śarendrais
tatvendubhiḥ saptanṛpais trirudraiḥ |
syādvakratā bhūmisutādikānām avakratā
tadrahitaiśca bhāmśaiḥ ||5||

bhauma-guru-śanīnām udayāstakālaḥ –

prācyāmudeti kṣitijo'ṣ-adasraiḥ śakrair guruḥ
saptakubhiśca mandaḥ |
svasvodayāṃśonita cakrabhāgaistrayo
vrajantyastamayaṃ pratīcyām ||6||

budha śukrayor udayāsta jñānam –

khākṣair jinair jñasitayor udayaḥ pratīcyām astaśca
pañcatithibhir munisaptabhūbhiḥ |
prāgugdmaḥ śaranakhaistridhṛtipramāṇair astaśca
tatra daśavahnibhir aṅgadevaiḥ ||7||

vakrādīnāṃ dinādisādhanam –

avakra vakrāstamayodayokta bhāga
adhikonāḥ kalikā vibhaktāḥ |
drākkendra bhuktyāpta dinair gataiṣyair
avakra vakrāstamayodayāḥ syuḥ ||8||

grahāṇāṃ kālāṃśāḥ pātavikṣepāśca –

sūryāsaptadaśatribhūparimitā rudrā navākṣendavaḥ
kālāṃśāḥ śaśino'nṛjoḥ kurahitāḥ pātāḥ kujād rāśayaḥ |
rudreśoṅkadaśadvipā athalavā aṣ-augrahāḥ kuñjarāḥ
śūnyaṃ śailabhūva svacañcalaphalair vyastair
amī saṃskṛtāḥ ||9||

bhaumādīnāṃ vikṣepakathanaṃ sādhanañca –

mandābhyāṃ budhaśukrayor athakujād vikṣepakāḥ kheśvarā
dvīṣukṣmāḥ ṣaḍagāḥ ṣaḍagniśaśinaḥ khatrīndavo liptikāḥ |
khe-ātpātayutāt tathā jñasitayoḥ śīghroccato dorjyakā
kṣepaghnī calakarṇahṛt trivihṛtā syād aṅgulādyaḥ śaraḥ ||10||

dṛkkarma sādhanam udayāsta sādhanañca –

prākpaścāt tribhahīnayuktakhacara krāntyakṣatoṃ'śā natāḥ
śuddhāste navateḥ syur unnatalavāḥ sādhye pṛthak tajjyake |
kṣepaghnī nataśiñjinī guṇaguṇā bhaktonatāṃśajyayā
svarṇaṃ labdhakalā grahe śaranatāṃśaikānyadiktve
kramāt ||11||

paścād vyastamitīha dṛṣ-ikhacaras tatsūryayor alpakaḥ
kalpyo'rkastv aparastanuśca gha-ikāḥ prāgvat tayor antare |
paścāt ṣaḍbhayutāt tu tā rasahatāḥ kālāṃśakāḥ santi taiḥ
proktebhyo'bhyadhikair gataḥ samudayo nyūnais tu gamyas
tataḥ ||12||

vyastaś cāstamayas tadanantara kalāḥ khābhrāgnibhiḥ saṅguṇā
bhāno rāśyudayena ced aparatas tatsaptamenoddhṛtāḥ |
tāḥ syuḥ kṣetrakalā javāntarahṛtā vakre javaikyoddhṛtā
yātaiṣyo'stamayo'thavā samudayojñeyo'tra labdhair
dinaiḥ ||13||

viśeṣa kathanam –

prāg dṛgrahaś ced adhiko raveḥ
syādūno'thavā paścima dṛggrahaśca |
proktes-akālāṃśa yuteḥ kalābhiḥ
sādhyās tadānīṃ divasā gataiṣyāḥ ||14||

agastyodayāsta kathanam –

akṣabhāṣ-a hati yuktavarjitāḥ
aṣ-agomitalavā gajādrayaḥ |
tatsame dinamaṇau ca kumbhabhūr yāti
darśanam adarśanaṃ kramāt ||15||

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Śṛṅgonnatyadhikāraḥ – 7

valanasādhanam –

krānteḥ kalāḥ sāyaka saṃskṛtendoḥ
saṣaḍbha sūryāyamasaṃskṛtāstāḥ |
vyarkendu dorjyāguṇitaiḥ palāṃśaiḥ
khārkoddhṛter apyatha saṃskṛtāśca ||1||
vyarkendudorāśibhir indriyaghnair bhaktā
bhaveyur valanāṅgulāni |

sitāsita bhāga kathanam –

vyarkendu ko-yaṃśa śarendubhāgo
hāro'munā ṣa-kṛtito yadāptam ||2||

dviṣ-haṃ ca hāronayutaṃ tadardhe syātāṃ
kramādatra vibhāsvabhākhye |

parilekha kathanam –

vidhāya sūtreṇa ṣaḍaṅgulena vṛttaṃ
digaṅkaṃ valanaṃ ca vṛtte ||3||
prāk śuklapakṣe parataśca kṛṣṇe
kendrād vibhāṃ tadvalanāgrasūtre |
kṛtvāvibhāgre svabhayā ca vṛttaṃ
jñeyendukhaṇḍākṛtir evam atra ||4||
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Grahayutyadhikāraḥ – 8

bhaumādīnāṃ kalātmakaṃ bimba sādhanam –

pañcāṅga saptāṅka śarāḥ pṛthaksthās trijya
aśukarṇāntara saṅguṇāstāḥ |
trighnaiḥ parākhyair vihṛtāḥ phalona–
yuktāḥ pṛthaksthās tribhamaurvikāyāḥ ||1||
karṇe'dhikone trihṛtā bhavanti
bimbāṅgulānīti kujādikānām |

yutikālajñānam –

divaukasor antaraliptikaughād gatyor viyogena
hṛtādyadaikaḥ ||2||
vakrī javaikyena dinair avātpairyātā
tayoḥ saṃyutir alpabhuktau |
vakre'thavā nyūntare'nyathaiṣyā
dvayoranṛjvor viparītamasmāt ||3||

yutisādhanam –

evaṃ labdhair grahayutidinaiścālitau tau samau staḥ
kāryau bāṇāviha śaśiśaraḥ saṃskṛto'sau svanatyā |
ekānyāśau yadi khagaśarāvantaraikyaṃ tayoryad yāmyo–
dakṣthaṃ khacaravivaraṃ siddhabhaktaṃ karāḥ syuḥ ||4||

jñeyau khe-au nijaśara diśāvekadiktve'lpabāṇo
vyastāśaḥ syād itarakhacarād antaraṃ syāt sphu-eṣuḥ |
mānaikyārdhādyucaravivare'lpe bhaved bhedayogaḥ
kāryaṃ sūryagrahavadakhilaṃ karma yallambanādyam ||5||

mandākrānto'nṛjurapi raviḥ śīghra induvikalpyo
nṛjyorvyastaṃ bhavati ca yuto'rkādvidhuḥ sā śarāśā |
lagnād alpe niśi divicare bhārdhayuktād analpe
dṛśyo yogo nijadinagate lagnam arkān na khe-āt ||6||

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Pātādhikāraḥ – 9

pātasambhavaṃ gatagamyajñānañca –

vinā sapātaindumihāyanāṃśakair yuto
raviḥ śītarucisca gṛhyate |
samāyanatve vyatipāta vaidhṛtāhvayastadaikye
rasabhe'rkabhe kramāt ||1||

pātas tadūnādhika liptikābhyo
bhuktyaikya labdhaiṣya gatair ahobhiḥ |

pātasya gataiṣya jñānaṃ –

tātkālikau tau ca tamaśca kṛtvā
prāgvat prasādhyo viśikhaḥ kalādiḥ ||2||

oje pade yugmapade vidhuśced eka
anyagolaśca sapātacandrāt |
jñeyastadānīṃ khalu yātapāto
gamyo'nyathātvena tato'pi kālāt ||3||

krāntikhaṇḍasya dhanarṇatvam –

krāntīṣu khaṇḍāni dhanaṃ krameṇa
vyastāni tāni svamṛṇam prakalpyam |

gata khaṇḍa sādhanam –

candrasya pātenduyutasya bhāgās tithyuddhṛtāḥ
syur gatakhaṇḍakāni ||4||

pātagataiṣya sādhanam –

kramotkramāt tadgaṇanā ca kāryā
cāpāhvayāḥ śeṣalavā vyatīte |
pāte'tha gamye tithitaśacyutāste dvidhā
dvidhā bhogyadalādikāni ||5||

dvitrīṇi vinyasya pṛthagdalāni
gamyāni gamye'tha gate gatāni |
ekasthamevāsya tu bhogyakhaṇḍaṃ
yasyālpakāścāyalavā bhavanti ||6||

viśvāṃśakenāpama bhogyakasya
bhogyāditaḥ krāntidalāni tāni |
saṃskṛtya pūrvaṃ śarakhaṇḍakaiśca syuḥ
saṃskṛtāni kramaśaḥ sphu-āni ||7||

pāta madhyānayanam –

ādye'lpacāpāṃśamito guṇaḥ
syāc cāpāntarāṃśāḥ samakhaṇḍakeṣu |

tithicyutāste viṣameṣu jahyāt svāṃśa–
ghna khaṇḍāni tithighna bāṇāt ||8||

śeṣaṃ tvaśuddhena hṛtaṃ lavādyaṃ
saṃśuddha khaṇḍāṃśa yutaṃ vibhaktam |
gatyā vidhoḥ ṣaṣ-iguṇaṃ gataiṣyair labdhair dinaiḥ
syāt khalu pātamadhyam ||9||

viśeṣaḥ –

apakramasya bhogyakaṃ yadeṣu khaṇḍataścyutam |
gataiṣyatāviparyayāt tadātra pātasādhane ||10||

sthitisādhanam –

aśuddha khaṇḍabhājitās trikhāśvi dasra nāḍikāḥ |
sthititaśca madhyapūrvato'grato'pi tatpramāṇikā ||11||

śuddhakhaṇḍa vicāraḥ –

yadākhileṣu khaṇḍakeṣv ihādya khaṇḍajātiṣu |
cyuteṣvapīha śeṣakaṃ khanāgasāgarādhikam ||12||

tadā na pāta sambhavo yadāsti sambhavas tadā |
viśuddhakhaṇḍa bhāgato gataiṣya kālasādhanam ||13||

pātasambhavaṃ sthitisādhanam –

tathā śarāvaśeṣakaṃ khanāgavedataś cyutam |
navaghnam antyakhaṇḍahṛd dalīkṛtaṃ sthitistadā ||14||

krāntisāmyaṃ sthiti lakṣaṇañca –

mānayogakhaṇḍato yāvadalpam antaram |
krāntisāmyameva tattāvadeva hi sthitiḥ ||15||

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Ravīndu parvādhikāraḥ – 10
(Parvasambhavādhikāraḥ)

śarasādhanam –

dvighno māsagaṇastrihṛdvibhayuto varṣābhradastrāṃśayug–
vaccoktārka gha-īphalaṃ śarahṛtaṃ svarṇaṃ tu tasmilalavāḥ |
yuktāmātamitair gṛhair atha rave rāśyardha yuktāśca te
tadbāhū ca lavā nijārdha sahitāḥ syād aṅgulādyaḥ śaraḥ ||1||

natasādhanam –

darśānte natanāḍikābdhi rahito yukto gṛhādyo raviḥ
prākpaścāyanāṃśakaiśca sahitastaddorgṛhonāhatāḥ |
śailāste dviguṇā lavādirayamastātsvākṣatoṃ'śā natās
tadvedāṃśamitā natiśca viśikhas tatsaṃskṛto 'rkagrahe ||2||

grahaṇasambhavāsambhavam –

gocandrā himagorbhavāśca taraṇer mānaikyakhaṇḍaṃ śare
tannyūne grahaṇaṃ bhavediti budhaiś cintyaḥ purā sambhavaḥ|
cakrādyaḥ khalu madhyamārka tamasoryogo dvinighno dviyuk–
parveśo munibhakta śeṣakamito jñeyo virañcyādikaḥ ||3||

sva vaṃśa varṇanam –

āsītsajjanadhāmni gehavivare śāṇḍilya gotro dvijaḥ
śrauta smārta vicārasāra caturaḥ saujanya ratnākaraḥ |
jyotirvit tilako maheśvara iti khyātaḥ kṣitau svairguṇais
tatsūnuḥ karaṇaṃ kutūhalam idaṃ cakre kavir bhāskaraḥ ||4||

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Nīradārka vicāraḥ – 11
(Nīradādhyāya)

niradārkaspaṣ-īkaraṇam –

samaliptīkṛte bhānau rāśyekaṃ śodhayedbūdhaḥ |
aṃśakā manavaścaiva śeṣaṃ cakrācca pātayet ||1||

kalitaṃ vagitaṃ dvighnaṃ cakraliptābhiruddharet |
labdhāḍhya itare saṅgeḥ taroviśvāṃśakairyutaḥ ||2||

samaliptārka saṃyukttācchodhayedudayabhāskarāt |
yaccheṣamādyasaṃyujttaṇ nīradārko hi saṃsphu-aḥ ||3||

asya prayojanam –

ravibhaumāṃśakaṃ dṛṣ-vā nirabhraṃ grahamādiśet |
śanisaumyanavāṃśe cetsalilaṃ kṣudravarṣaṇam ||4||

śaśiśuktranavāśe ca prāvṛ-kāle mahajjalam |
guroraśakamāsādya dṛśyate sabalāhakaḥ ||5||

grahaṇo vā vilagne vā meghacchāyāṃ vijānataḥ |
tasyāhaṃ pādayugalaṃ kusumāñjalinārcaye ||6||

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