IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

VEDIC MATHEMATICS IN CONTEXT OF ADVANCE CALCULUS

Name- Deva Anjali

Guide Name - Dr. Deepali Brijlal Banswal

Department of Mathematics

College Name - Malwanchal University, Indore

Abstract

This study aims to explore the potential benefits of incorporating Vedic mathematics techniques into advanced calculus education. By analyzing the effectiveness of Vedic math in enhancing students' understanding and performance in advanced calculus, this study seeks to provide insights into how Vedic mathematics can be used to improve the teaching and learning of calculus. Through a comprehensive literature review and empirical research, this study will assess the impact of Vedic mathematics on students' calculus proficiency, problem-solving skills, and overall academic performance. The findings of this study could have significant implications for the development of new teaching strategies and pedagogical approaches in advanced calculus education.

Introduction

The main purpose of teaching mathematics in schools is to foster a logical mentality towards the subject. Nowadays, mathematics is a mandatory subject for primary and secondary school students. However, many students consider mathematics to be a dry and challenging subject. It is the responsibility of teachers to make mathematics education easy, enjoyable, and accessible to every child. Mathematics is considered the mother of all sciences and is vital in everyone's life. Without mathematics, it would be difficult to survive in daily life. Mathematics is used by everyone, from students to businesspeople. It is impossible to imagine life without mathematics. Many ancient cultures, including India, developed simple methods and techniques to solve mathematical problems, which were later used in various fields like construction of temples, medicine, science, astrology, etc. Due to these developments, India became the richest nation in the world. Therefore, every child has the right to receive quality mathematics education to succeed in life.

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

MATHEMATICS – MEANING AND DEFINITIONS

The term 'Mathematics' might be characterized in various manners. The word reference significance of mathematics is that "it is either the study of number and space or the study of estimation, amount and extent. Bacon said "Mathematics is the entryway and key to all sciences". All the above definitions underline mathematics as an instrument particularly appropriate for managing logical ideas. As indicated by Lindsay, 'Mathematics is the language of actual sciences and absolutely not any more wonderful language with its signs, images, terms and activities, which can deal with thoughts with an accuracy and succinctness that is obscure to different dialects.

The National Policy of Education (NPE) (1986) expressed "Mathematics could be considered as a medium to prepare a kid to foster his intuition limit, to foster his thinking power, and to intelligible legitimately". Mathematics ought to be displayed as a perspective, a craftsmanship or type of magnificence, and as human accomplishment.

Nature of Mathematics

- **Mathematics – A study of Discovery:** The statement of mathematics connections are in representative structure in words, in letters, by outlines or by chart. At first a youngster's revelations might be observational. Yet, later, when its force of deliberation is enough evolved, it will actually want to see the value in the certitude of the mathematical ends that it has drawn. This will give it the delight of finding mathematical facts and ideas. Mathematics offers a simple and early chance to make free disclosures.
- **Mathematics – A scholarly Game:** Mathematics can be treated as a scholarly game with its own guidelines and with no connection to outside models. From this perspective, mathematics is chiefly a question of riddles, oddities and critical thinking – a kind of sound mental exercise.
- **Mathematics-The Art of Drawing outcomes:** One of the significant elements of the school is to acclimate kids with a method of thought which helps them in reaching right determinations and derivations.
- **Mathematics-As a Tool Subject:** Mathematics set up its own objectives to seek after. Its tutors of the past designing, actual science and trade presently turned into close to its companions. As indicated by Howard F. Fehr (1996), "If mathematics had not been valuable, it would sometime in the past have vanished from our school educational program as required examination".

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

- **Mathematics-An Intuitive Method:** Intuition when applied to mathematics includes the concretization of a thought not yet expressed as a type of tasks or model. A kid shapes a disguised arrangement of constructions for addressing his general surroundings.

BACKGROUND OF MATHEMATICAL INFORMATION IN THE VEDAS

"Veda" has two essential implications. The initial, an exacting interpretation of the Sanskrit word is "information" (Veda). The second, and most normal significance of the word, alludes to the consecrated old writing of Hinduism, the Vedas, an assortment of songs, verse, and Hindu stylized formulae (Veda). Accepted to be one of the most established human put down accounts, the Vedas date back more than 4000 years. All in all, the Vedas incorporate engineering, cosmology and so on In spite of the fact that there is contention about whether the actual Vedas really incorporate reference to mathematics, the refined mathematics has really been followed back to the Vedic time. Antiquated Indian Vedic human advancements are known for being gifted in calculation, polynomial math and computational mathematics adequately complex to join things like unreasonable numbers. Besides, all old Indian mathematics writing is formed totally in stanza; there was a custom of creating short sutras, similar to those of Vedic mathematics, to guarantee that data would be safeguarded regardless of whether put down accounts were harmed or lost.

MATRICS, DIFFERENTIALS AND INTEGRATION

MINORS

Consider the determinant A=a11a12a13a21a22a23a31a32a33

If the element aij is removed from the row and column, the minor of the element aij is expressed as Mij.

The minor of the element a12=a21a23a31a33=M12

The minor of the element a23=a11a12a31a32=M23

The minor of the element a33=a11a12a21a22=M33

- **Co-factors:**

The cofactor of the element aij is the minor multiply by (-1) i+ j.

The element's co-factor is a12 = A12.

A12=-11+2M12

=(-1)1+2a21a23a31a33=(-1)3a21a23a31a33=-a21a23a31a33

The Co-factor of the element a23=A23

A23=-12+3M23

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

=(-1)2+3a11a12a31a32=(-1)5a11a12a31a32=-a11a12a31a32

The Co-factor of the element a33= A33

A33=-13+3M33

= (-1)6a11a12a21a22=a11a12a21a22

- **Adjoint of a Matrix:**

The Adjoint of a Matrix is obtained by first constructing a matrix from the co-factors of the elements in the provided matrix A, and then transposing it.

If A=a11a12a13a21a22a23a31a32a33 then

Adj (A) = transpose of the matrix formed by co-factor

Adj(A)=A11A21A31A12A22A32A13A23A33 Where, Aij is the Co-factor of the element a_{ij}. **[1]**

If A=133143134 is given matrix, then find its Adjoint.

A11 = the co-factor of a11in

A = (-1)1+14334 = (-1)24334=4334=16-9=7

A12= the co-factor of a_{12} in

A = (-1)1+21-323 = (-1)31-323=-1-323=-(3+6)=-9

Similarly,

A13= -5, A21= - 4, A22= 1, A23= 3,A31= -5, A32= 4,A33= 1

Adj (A) = transpose of the matrix formed by co-factor

Adj(A)=A11A21A31A12A22A32A13A23A33=7-4-5-914-531

Where, Aijis the Co-factor of the element aij

∴Adj(A)=7-4-5-914-531

INTRODUCTION TO DIFFERENTIAL CALCULUS:

The development of both the Differential Calculus and the Integral Calculus is the most significant mathematical achievement. For a wide variety of real-life applications which require us to find change in one parameter with respect to another for Differential Calculus plays an important role.

For any function at a given point, you can find its derivative geometrically by drawing an angle at that point, then evaluating the slope. If y = f(x) given then

$$\frac{dy}{dx} = f'(x)$$

By using Dhvaja Ghata (power):

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

The method to find first differential of the each term of the quadratic expression ax2 + b x + c, is by multiplying its Dhvaja Ghata (power) by the Anka (its coefficient) and educing by one.

Example: 1

Find derivative of quadratic expression x2 - 9x + 14

Let E = x2 - 9x + 14.

As per current method, taking derivative of y w.r.t. x

$\frac{dy}{dx}$= 2x – 9(1) + 0

$\frac{dy}{dx}$ =2x – 9

By using Dhvaja Ghata,

Finding first differential of each term of quadratic expression x2 - 9x + 14,

x^2 gives 2x; - 9x gives - 9 and 14 gives zero.

Therefore, D1 = f $\frac{d}{dx}$ (x2 - 9x + 14) = 2x - 9.

Calana-Kalanābhyām Sūtra: Meaning:

Differential Calculus Discriminant of the quadratic first differential and square root of Discriminant are shown in this Sūtra. ŚRĪ BHĀRATĪ KRA known this Sūtra was the Calculus formula for finding the two roots of a quadratic equation that was given. First differential, he argues, is equal to the square root of original quadratic equation's discriminant.

Thus, roots of given quadratic equations are obtained by solving two simple equations.

Example:

Solve : $x^2 – x - 12 = 0$

The first differential D_1 = 2x - 1 and

The square root of the discriminant is ± √1 + 48 = ± √49 = ±7

As per above rule, D_1 =± √Discriminant ∴ 2x - 1 = ±7

Thus the given equation is broken down into two simple equations

∴ 2x - 1 = ±7

∴ 2x = ±7 + 1

∴ x = 4 OR x = −3

IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

FACTORS OF POLYNOMIALS & DIFFERENTIAL CALCULUS BY GUṆAKASAMUCCAYAṆ:

There is a relationship between factors and their successive differentials in polynomials. It is possible to calculate the differentials of a polynomial if one knows its factors.

Differential Calculation Procedure:

Write given polynomial in its standard form with 1 being constant term preceding x_n.

Substitute linear factors for the polynomial's coefficients.

D1 of a polynomial is obtained by adding factors according to the Guakasamuccaya Stra. Below are examples of how to find Differentials of Quadratic Expression, Cubic Expression, and Quartic Equation, as well as a polynomial of 5th power.

D5 = 5! [Sum of factor-products taken (n-5) at a time]

Differentials of quadratic expression:

According to Guakasamuccaya Sūtra, if we can factorize the quadratic equation in two linear factors a_1 = x + m and a = x + n then then by adding that two linear factors we get 1st differential D1.

First Differential D1 = 1! [Sum of factor product taken (2 - 1) = 1 at a time]

Second differential D2 = 2!

Example

Evaluate possible differentials for given expression x2 - 9x + 14

As per current method,

Differentials of Cubic Expression:

For cubic expression if we can factorize into three linear factors

$$a_1 = (x + r)\,, a_2 = (x + s)\; and\; a3 = (x + t);$$

Now, differentials are as follows.

First Differential D1 = 1! [Sum of factor product taken (3-1) = 2 at a time]

$$i.e. D_1 = \sum_{i.j=1}^{3} a_i a_j = [a_1a_2 + a_2a_3 + a_1a_3]$$

Second Differential D2 = 2! [Sum of factor product taken (3 - 2) = 1 at a time]

$i.e. D_2 = 2! \sum_{i.j=1}^{3} a_i = 2! [a_1 + a_2 + a_3]$ = 2! [(x + r) + (x + s) + (x + t)]

Third differential D_3 = 3!

Example:

Find possible number of differentials of cubic expression $x^3 + 7x^2 + 14x + 8$.

First find factors of E = $x^3 + 7x^2 + 14x + 8$

Sum of all coefficients is not zero.i.e.1 + 7 + 14 + 8 ≠ 0

∴ (x – 1) is not a factor of given expression.

Sum of co-efficient of even power of x = 7 + 8.

Sum of co-efficient of odd power of x = 1 + 14

I.e. 7 + 8 = 1 + 14 = 15

∴ One factor of given expression is (x + 1).

By Ādyamadyenāntyamantyena, divide the 1st and the last term of given expression E by the first and last term of already found factor i.e. (x + 1) respectively.

Since given expression is in cubic form, we get the first and last co-efficient of the quadratic expression.

First co-efficient = $\frac{x^3}{x} = x^2$& $last\ co - efficient\ = \frac{8}{1} = 8$

For finding middle coefficient, subtract the sum of the above obtained co-efficient of quadratic expression

I.e. 1 + 8 = 9 from the sum of co-efficient of odd (even) power = 15

i.e. 15 - (1 + 8) = 15 - 9 = 6 is the co-efficient of the middle term of quadratic expression.

∴ Q = x^2 + 6x + 8

By using Ānurūpyea and Ādyamadyenāntyamantyena Sūtras:

Q = (x + 2) (x + 4)

∴ E = x^3 + 14x + 7x^2 +8 = (x + 4) (x + 1) (x + 2)

Another way for finding Factors:

Let E = x^3 + 7 x^2 + 14x + 8

Here,

Sum of co-efficient of even power of x = Sum of co-efficient of odd power of x = 15 & the last term is 8.

Factors of 8: 1, 2, 4 OR 2, 2, 2.

Sum of the three factors = 7 (∵ co-efficient of x^2 = a + b + c = 7)

∴ We select the group 1, 2, 4. [∵ 1 + 2 + 4 = 7]

Also testing for the co-efficient of the variable x.

Here ∑ab = 14 = co-efficient of x.

∴ E = x^3 + 7 x^2 + 14x + 8 = (x + 4) (x + 1) (x + 2)

First differential D1 =$\sum_{i.j=1}^{3} a_i a_j\ ;\ i \neq j, i < j$

= x^2 + 6x + 8 + x^2 + 3x + 2 + x^2 + 5x + 4

= $3x^2$ + 14x + 14

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

Second differential D2 =2! $\sum_{i.=1}^{3} a_i$

= 2 [(x + 4) + (x + 2) + (x + 1)]

= 2 (3x + 7) = 6x + 14

Third differential D3 = 3! = 6

ANALYSIS AND DATA INTERPRETATION

This plays the most important role in any research work which provides a link between the data (whether qualitative or quantitative) the researcher has and the information or interpretation he can derive from his research data collected from different sources. To know the effectiveness of the Vedic method of calculus over the traditional method, above mentioned null hypotheses would be tested for a two-tailed test using t-test for small sample

- **Testing of Null hypothesis - No. 1**

To test the null hypothesis No. 1 'There is no significant difference between Average scores of both C.G and E.G of the under-graduate after Pre-test', t-test for small sample is used with the above- mentioned formula. The necessary values for calculation as a t-value of both C.G and E.G are given in Table No.:1

Table No: 1 Necessary values for calculation- t-value of C.G and E.G on Pre-test.

Group Name	N	Average	S.D. (σ)	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Experimental Group	30	8.00	3.12	0.565	2.00 @0.05 level	56	Failed to reject
Control Group	28	8.43	2.58		2.66 @0.01 level		

the t-value calculated using table 2 came out to be 0.57 (or 0.565) is less than the table value at both 0.05 and 0.01 with df 56 (N_1 + N_2 -2). Therefore, the null hypothesis cannot and has not been rejected at both levels of significance. This indicates that "difference between the Mean of the control and experimental groups is not statistically significant". So, both the groups had performed similarly in respect of pre-test on calculus knowledge.

- **Testing of Null hypothesis**

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

To test the null hypothesis No. 2, 'Not much deviation was found between mean scoring values of control and experimental groups of under-graduates after Post-test', t-test for small sample is used with the same formula used for testing the null hypothesis - 1. The necessary values for calculation - t-value of C.G. and E.G are given in Table No. 3.

Table No: 2 Necessary values for calculation- t-value of C.G. and E.G on Post-test.

Group Name	N	Average	S.D. (σ)	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Experimental Group	30	17.83	1.90	16.02	2.00 @0.05 level 2.66 @0.01 level	56	Rejected
Control Group	28	10.46	1.64				

The t value calculated using Table 3 was come out to be 16.02 higher as compared to significant value 0.05 as well as 0.01 with *deg of freedom* 56. Therefore, "null hypothesis" has been rejected at both significant values. This indicates that the deviation in mean scoring values of the control and experimental groups is statistically significant at 0.05 and 0.01 levels of significance. The research hypothesis revealed the much variation in mean scoring values of both groups on the Post-test may be accepted. So, Experimental group having more mean value has performed better in the post-test. As other variables are constant for both the group, change in the dependent parameter (achievement in calculus) is result of independent variable (Vedic method of calculus). Thus, it can be concluded that the Vedic method of calculus is effective over the conventional method in terms of students' achievement in the Post-test.

- **Testing of Null hypothesis - No. 3:**

To test the null hypothesis No. 3 'Not much deviation observed in Mean scoring values on the Calculus Test amongst Experimental Group after Post-test on basis of gender, same formula has been used to calculate t-value. The necessary values for calculation and t-value of boys as well as girls of the Experimental Group on Post-test are given in Table No.: 4.

Table No.:3 Necessary values for calculation- t-value of boys, girls of the Experimental Group on Post-test

Experimental Group-Name	N	Average	S.D. (σ)	t-value Calculated	t-value (Table value)	*df*	Status of Null-hypothesis
Boys	19	17.63	1.89	0.77	2.05@0.05 level 2.76 @0.01 level	28	Failed to reject
Girls	11	18.18	1.85				

The t value calculated using Table 6.4 was come out to be (0.77) that is greater as compared to significant values 0.05 and 0.01 with *df* 28 (N1 + N2 -2). So, the null hypothesis could not be rejected at both levels of significance. This indicates that the deviation in mean scoring values of the boys as well as girls of Experimental Group is not statistically significant. It may be concluded that gender could not play any role in the Post-test of sixth graders on the Vedic method of calculus.

- **Testing of Null hypothesis - No. 4**

To test the null hypothesis No. 4 'Not much deviation was found in mean scoring values on the Calculus Test of the Control group of under-graduates after Post-test based on gender, the same formula has been used to calculate t-value. The necessary values for calculation and t-value of boys as well as girls of Conventional **Group** on Post-test are given in Table No: 5.

Table No :4 Necessary values for calculation and t-value of boys, girls of Conventional **Group on Post-test**

C.G-Name	N	Average	S.D.	t-value Calculated	t-value (Table value)	*df*	Status of Null-hypothesis
Boys	15	10.93	1.12	1.65	2.06 @0.05 level 2.78 @0.01 level	26	Failed to reject
Girls	13	9.92	1.94				

The t value calculated using Table 5 was come out to be 1.65 that is less than the significant values 0.05 and 0.01 with *df* 26 (N1 + N2 -2). Therefore, the null hypothesis cannot be rejected at both levels. This indicates that deviation in mean scoring values of the boys as well as girls of Conventional Group is not statistically significant. As the difference of means of boys andgirls are not significant it may be concluded that gender could not play any role in the Control group on the Post-test of under-graduates onthe Vedic method of calculus.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

- **Testing of Null hypothesis - No. 5**

To test the null hypothesis No. 5 'Not much deviation was found in mean scoring values between both Conventional **Group** and E.G on the Calculus Test of the E.G, the same formula has been used to calculate t-value. The necessary values for calculation and t-value of pre, post-test of the E.G., are given in Table No: 5.

Table No:5 Necessary values for calculation and t-value of pre-test and post-test of Experimental group

E.G. Name	N	Average	S.D.	t-value Calculated	t-value Table value	*df*	Status of Null-hypothesis
Pre-test	30	8.00	3.12	14.89	2.00 @0.05 level 2.66 @0.01 level	58	Rejected
Post-test	30	17.83	1.90				

The t value calculated using Table 6 was come out to be (14.98) that is higher as compared to significant values 0.05, 0.01 with dreg of freedom *58*. Therefore, null hypothesis has been rejected at both levels. This indicates that the deviation in mean scoring values of Pre-test as well as Post-test of E.G is statistically significant. As the difference of mean is significant it may be concluded that students of the E.G have implemented better in post-test due to implementation of independent variable, Vedic method of calculus. This also indicates that the Vedic method of calculus helped the experimental group to minimize their mistakes and get a better result.

- **Testing of Null hypothesis- No. 6**

To test the null hypothesis No. 6 'Not much deviation has been found in mean scoring values Pre, Post-test on Calculus Test of Conventional **Group**, the same formula has been used to calculate t-value. The necessary values for calculation -t-value of pre, post-test of Conventional **Group** is given in Table No: 6

Table No.: 6 Necessary values for calculation- t-value of pre, post-test of Conventional **Group.**

C.G.	N	Aver.	S.D.	t-value Calculated	t-value (Table value)	*df*	Status of Null-hypothesi

							s
Pre-test	28	8.43	2.58	3.62	2.00 @0.05 level	58	Rejected
Post-test	28	10.46	1.64		2.66 @0.01 level		

The t value calculated using Table 6 was come out to be (3.62) that is higher as compared to significant values at both 0.05, 0.01 with *deg of freedom 58*. So, null hypothesis is rejected at both levels. This indicates that the deviation in mean scoring values of the Pre, post-test of the Conventional **Group**. is statistically significant. As the difference of mean is significant it may be concluded that students of the experimental group have performed better. But the mean score is very less in comparison to the average score of the E.G. It may be concluded that using the traditional method of calculus students failed to minimize the common mistakes which can be avoided by the Vedic method of calculus as shown in the case of the Experimental group.

CONCLUSION

In conclusion, the application of Vedic Mathematics techniques in the context of advanced calculus has shown promising results in enhancing students' understanding and performance in this field. Vedic Mathematics principles have been derived from ancient Indian texts, such as the Vedas, and have been passed down through generations of scholars and mathematicians. The principles of Vedic Mathematics are based on sutras or aphorisms that contain the essence of a particular mathematical concept or technique.

In the context of advanced calculus, Vedic Mathematics techniques have been used to solve complex problems involving derivatives, integration, differential equations, and partial differential equations. The use of Vedic Mathematics techniques in these areas has shown to improve students' ability to solve problems quickly and efficiently, especially in mental calculations.

One of the primary benefits of using Vedic Mathematics techniques in advanced calculus is their simplicity and ease of use. These techniques are easy to learn and can be applied to a wide range of mathematical problems, allowing students to solve complex problems with ease. The use of Vedic Mathematics techniques has also been shown to help students develop their mental calculation abilities, which is an important skill in many fields.

Another benefit of using Vedic Mathematics techniques in advanced calculus is their cultural significance. Vedic Mathematics is part of India's rich cultural heritage and reflects the country's tradition. The use of these techniques helps to promote cultural diversity and understanding in mathematics education.

However, it is important to note that the use of Vedic Mathematics techniques in advanced calculus should not replace the traditional methods of teaching. Rather, it should be used as a supplement to the traditional methods, as it can provide students with additional tools and techniques to solve complex problems.

Further research is needed to explore the full potential of Vedic Mathematics techniques in advanced calculus education. Future studies should investigate the effectiveness of Vedic Mathematics techniques on students' long-term retention of concepts, as well as their performance in higher-level mathematics courses. Additionally, studies should also explore the impact of Vedic Mathematics techniques on students from different cultural backgrounds and with varying levels of mathematical proficiency.

The application of Vedic Mathematics techniques in the context of advanced calculus has shown promising results in enhancing students' understanding and performance in this field. The use of these techniques can provide students with additional tools and techniques to solve complex problems, as well as promote cultural diversity and understanding in mathematics education. Further research is needed to fully explore the potential of Vedic Mathematics techniques in advanced calculus education.

REFERENCES

1. A Deepal, C.N. Marimuthu (2018), "High Speed VLSI Architecture for Squaring Binary Numbers Using YāvadūnamSūtra and Bit Reduction Technique", International Journal of Applied Engineering Research ,Volume 13,Number 6 pp. 4471-4474
2. A. Ansari, Fractional exponential operators and time-fractional telegraph equation, Springer, 2012.
3. A. Faraj, T. Salim, S. Sadek and J. Smail, Generalized Mittag-Leffler Function Associated with Weyl Fractional Calculus Operators, Hindawi Publishing Corporation Journal of Mathematics, Volume 2013, Article ID 821762, 5 pages.
4. Abhijeet Kumar et.al (2012), "Hardware Implementation of 16 * 16 bit Multiplier and Square using Vedic Mathematics" International Conference on Signal, Image and Video Processing (ICSIVP) January-2012 ,pp.309-314 http://www.researchgate.net/publication
5. Acharya EkaRatna (2015), "Mathematics Hundred Years Before and Now", History Research Vol.3, No. 3, pp.41-47

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

6. Agarwal Jyoti, Vijay Matta, Dwejendra Arya,(2013) "Design and Implementation of FFT Processor Using Vedic Multiplier With High Throughput", International Journal of Emerging Technology And Advanced Engineering,Vol:3, Issue:10,pp:207-211
7. AggrawalSarwan(Nov 2013), "Observations from Figuring" by Shakuntala Devi" http://vedicmaths.org
8. Agrawal Kajal et.al (2018) , "A Review Paper on Multiplier Algorithm for VLSI Technology" National Conference on advanced Research Trends in Information and Computing Technologies (NCARTICT),International Journal of Scientific Research in Science, Engineering and Technology, Vol-4,Issue-2
9. Ajai Kumar Shukla et al (2017)," A Comparative Study of Effectiveness of Teaching Mathematics through Conventional & Vedic Mathematics Approach", Educational Quest: An Int. J. of Education and Applied Social Science: Vol. 8, No. 2 AthiraMenon M S (2017)," Vedic Mathematics Based Floating Point Multiplier Implementation for 24 Bit FFT Computation", IOSR Journal of Electronics and Communication Engineering.
10. Angshuman Khan &Rupayan Das (2015). Novel Approach of Multiplier Design Using Ancient Vedic Mathematics. 10.1007/978-81-322-2247-7_28.
11. Anitha, R, Alekhya Nelapati, LinecyJesima, W &Bagyaveereswaran, V 2012, 'Comparative Study of High-performance Braun's Multiplier using FPGAs, Journal of Electronics and Communication Engineering, vol. 1, no. 4, pp. 33-37.
12. Anju , Agrawal V.K (2013)., "FGPA implementation of low power and high speed Multiplier using Vedic Mathematics" IOSR Journal of VLSI and Signal Processing Vol. 2, Issue 5, pp 51-57
13. Archana V Katgeri (2016)" EFFECTIVENESS OF VEDIC MATHEMATICS IN THE CLASSROOMS" Scholarly Research Journal for Interdisciplinary Studies, UGC Approved Sr. No.45269, SEPT-OCT 2017, VOL- 4/36 10.21922/srjis.v4i36.10016
14. Arish, S & Sharma, RK 2015, 'An Efficient binary multiplier design for high speed applications using Karatsuba algorithm and UrdhvaTiryagbhyam algorithm', Proceedings of IEEE Global Conference on Communication Technologies, pp. 192-196.
15. AtaraShriki (2014). LOOKING AT ALGEBRAIC EXPRESSIONS THROUGH THE LENS OF VEDIC MATHS. Mathematics Teaching. 241. 44-46.
16. B. Satyanarayana and Y. P. Kumar, Some finite integrals involving multivariable polynomials, H-function of one variable and H-function of 'r' variables, African

ISSN PRINT 2319 1775 Online 2320 7876
  UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

Journal of Mathematics and Computer Science Research Vol. 4(8), pp. 281-285, August 2011, ISSN 2006-9731 ©2011 Academic Journals.

17. B. Shubhaker (2018)," High Speed Vedic Multiplier Design using FPGA", International Journal of Advance Research, Ideas and Innovations in Technology.
18. Babaji D.K.R. (Aug 2012) "Solving system of linear equation Using Parāvartya rule in Vedic Mathematics" www.vedicmaths.org
19. Bajaj Ronak, (2005), "Vedic Mathematics, The Problem Solver", Black Rose publications.