International Journal of Mathematics Trends and Technology
ISSN: 2231 – 5373 / https://doi.org/10.14445/22315373/IJMTT-V68I3P507
Volume 68 Issue 3, 33-42, March 2022

Original Article

Mathematical Analysis of Some Infinite Power Series

Govind Raj Naunyal[1], Updesh Kumar[2], Dinesh Verma[3]

[1,2]*Department of Mathematics, KGK (PG) College Moradabad.*

Received Date: 21 February 2022
Revised Date: 30 March 2022
Accepted Date: 02 April 2022

Abstract - *Power series in one variable is an infinite series. It is one of the most useful types of series in analysis; it is work just as well as for complex numbers as real numbers. We can use them to define transcendental functions. In this paper, we will find the Mahgoub Transformation of some power series. The purpose of paper is to prove the applicability of Mahgoub transform to some significant infinite power series.*

Keywords - *Mahgoub transformation, Power series.*

I. INTRODUCTION

Mahgoub transformation is a mathematical tool used to obtain the solutions of differential equations without finding their general solutions. It has applications in nearly all engineering disciplines [1, 2, 3, 4, 5, 6,7,8,9,10,11,12,13,14,15]. It also comes out to be very effective tool to find the Mahgoub Transformation of some power series [16,17,18,19,20,21,22,23,24,25,26]. In this paper, we present a new approach called Mahgoub transform approach to find the Mahgoub Transformation of some power series.

II. DEFINITIONS

A. Mahgoub Transform

If the function $f(\mathrm{x})$, $\mathrm{x} \geq 0$ is having an exponential order and is a piecewise continuous function on any interval, then the Mahgoub transform of $\hbar(\mathrm{y})$ is given by

$$\mathrm{M}\{f(\mathrm{x})\} = \mathrm{r}\int_0^\infty e^{-rx} f(\mathrm{x})dx = \bar{\hbar}(r)$$

The Mahgoub Transform [1, 2, 3] of some of the functions are given by

- $M\{x^n\} = \frac{n!}{r^n}$, $where\ n = 0,1,2,..$
- $M\{e^{ax}\} = \frac{r}{r-a}$,
- $M\{sinax\} = \frac{ar}{r^2+a^2}$,
- $M\{cosax\} = \frac{r^2}{r^2+a^2}$,
- $M\{sinhax\} = \frac{ar}{r^2-a^2}$,
- $M\{coshax\} = \frac{r^2}{r^2-a^2}$.

B. Inverse Mahgoub Transform

The Inverse Mahgoub Transform of some of the functions are given by

- $\mathrm{M}^{-1}\{\frac{1}{r^n}\} = \frac{x^n}{n!}$, $n = 2, 3, 4 \ldots$
- $\mathrm{M}^{-1}\{\frac{r}{r-a}\} = e^{ax}$

- $M^{-1}\{\frac{r}{r+a^2}\}= \frac{1}{a}\sin ax$
- $M^{-1}\{\frac{r^2}{r^2+a^2}\} = \cos ax$
- $M^{-1}\{\frac{ar}{r^2-a^2}\}= \frac{1}{a}\sin hax$
- $M^{-1}\{\frac{r^2}{r^2-a^2}\} = \frac{1}{a}\cos hax$

C. Mahgoub Transform of Derivatives

The Mahgoub Transform [1, 2, 3] of some of the Derivatives of h(y) are given by

- $M\{h^{'}(r)\} = rM\{h(r)\} - \mathrm{r}\, h(0)$
- $M\{h^{''}(y)\} = r^2\overline{h}(r) - r^2 h(0) - \mathrm{r}h^{'}(0),$
  and so on.

Power series [4, 5, 6,]:

$$\sum_{n=0}^{\infty} b_n z^n = b_0 + b_1 z + b_2 z^2 + \cdots b_n z^n$$

D. Maclaurin series [4, 5, 6,]:

$$y = \sum_{n=0}^{\infty} \frac{y^{(n)}}{n!} z^n = y_0 + \frac{y_0{}'}{1!} z + \frac{y_0{}''}{2!} z^2 + \frac{y_0{}'''}{2!} z^3 \dots \dots \dots$$

III. METHODOLOGY

A. Mahgoub Transformation of Geometric Series later than the expanding to power series appearance [4, 5, 6,]:

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n = f(x)$$

$$M\{f(x)\} = M\left\{\sum_{n=0}^{\infty} x^n\right\}$$

$$= r\int_0^{\infty} e^{-rx} \sum_{n=0}^{\infty} x^n \, dx$$

$$= \sum_{n=0}^{\infty} r\int_0^{\infty} e^{-rx}\, x^n dx$$

$$= \sum_{n=0}^{\infty} M\{x^n\}$$

$$= \sum_{n=0}^{\infty} \frac{n!}{r^n}$$

Hence,

$$M\{f(x)\} = \sum_{n=0}^{\infty} \frac{n!}{r^n}$$

B. Mahgoub Transformation of the Power series expansion of e^x later than the expanding to power series appearance $[\mathbf{4}, \mathbf{5}, \mathbf{6},]$

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = f(x)$$

$$M\{f(x)\} = M\left\{\sum_{n=0}^{\infty} \frac{x^n}{n!}\right\}$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=0}^{\infty} \frac{x^n}{n!}\right\}dx$$

$$= \sum_{n=0}^{\infty} r\int_0^{\infty} e^{-rx}\frac{x^n}{n!}dx$$

$$= \sum_{n=0}^{\infty} \frac{1}{n!}\left[r\int_0^{\infty} e^{-rx}x^n dx\right]$$

$$= \sum_{n=0}^{\infty} \frac{1}{n!}E\{x^n\} = \sum_{n=0}^{\infty} \frac{1}{n!}.\frac{n!}{r^n}$$

Hence, $\quad E\{f(x)\} = \sum_{n=0}^{\infty} \frac{1}{r^n}$

C. Mahgoub Transformation of the Power series expansion of $log(1+x)$ later than the expanding to power series appearance $[\mathbf{4}, \mathbf{5}, \mathbf{6},]$

$$\log(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}x^n = f(x)$$

$$M\{f(x)\} = M\left\{\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}z^n\right\}$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}x^n\right\}dx$$

$$= \sum_{n=1}^{\infty} r\int_0^{\infty} e^{-rx}\frac{(-1)^{n+1}}{n}x^n dx$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}\left[r\int_0^{\infty} e^{-rx}x^n dx\right]$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}\ M\{x^n\}$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}\ \frac{n!}{r^n}$$

$$= \sum_{n=1}^{\infty} (-1)^{n+1}\frac{(n-1)!}{r^n}$$

Hence ,

$$M\{f(x)\} = \sum_{n=1}^{\infty} (-1)^{n+1}\frac{(n-1)!}{r^n}$$

D. Mahgogub Transformation of the Power series expansion of $\boldsymbol{log(1-x)}$ later than the expanding to power series appearance[**4**, **5**, **6**,]

$$\log(1-x) = \sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} x^n = f(x)$$

$$M\{f(x)\} = M\left\{\sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} x^n\right\}$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} x^n\right\} dx$$

$$= \sum_{n=1}^{\infty} r\int_0^{\infty} e^{-rx} \frac{(-1)^{2n-1}}{n} x^n dz$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} r\int_0^{\infty} e^{-rx} x^n dx$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} M\{x^n\}$$

$$= \sum_{n=1}^{\infty} \frac{(-1)^{2n-1}}{n} \frac{n!}{r^n}$$

$$= \sum_{n=1}^{\infty} (-1)^{2n-1} \frac{(n-1)!}{r^n}$$

Hence ,

$$M\{f(z)\} = \sum_{n=1}^{\infty} (-1)^{2n-1} \frac{(n-1)!}{r^n}$$

E. Mahgogub Transformation of the Power series expansion of $\boldsymbol{log\frac{(1+X)}{(1-X)}}$ later than the expanding to power series appearance[**4**, **5**, **6**,]

$$\log\frac{(1+x)}{(1-x)} = \sum_{n=1}^{\infty} \frac{2}{2n-1} X^{2n-1} = f(x)$$

$$M\{f(z)\} = M\left\{\sum_{n=1}^{\infty} \frac{2}{2n-1} x^{2n-1}\right\}$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=1}^{\infty} \frac{2}{2n-1} x^{2n-1}\right\} dx$$

$$= \sum_{n=1}^{\infty} r\int_0^{\infty} e^{-rx} \frac{2}{2n-1} x^{2n-1} dx$$

$$= \sum_{n=1}^{\infty} \frac{2}{2n-1}\left[r\int_0^{\infty} e^{-rx} x^{2n-1} dx\right]$$

$$= \sum_{n=1}^{\infty} \frac{2}{2n-1} M\{x^{2n-1}\}$$

$$= \sum_{n=1}^{\infty} \frac{2}{2n-1} \frac{(2n-1)!}{r^{2n-1}}$$

$$= \sum_{n=1}^{\infty} 2\,\frac{(2n-2)!}{r^{2n-1}}$$

Hence,

$$M\,\{f(z)\} = \sum_{n=1}^{\infty} 4\,\frac{(n-1)!}{r^{2n-1}}$$

F. Mahgogub Transformation of the Power series expansion of $Cosx$ later than the expanding to power series appearance [4, 5, 6,]

$$\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} x^{2n} = f(x)$$

$$M\{F(z)\} = M\left\{\sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} x^{2n}\right\}$$

$$= r\int_0^{\infty} e^{-rx} \left\{\sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} x^{2n}\right\} dx$$

$$= \sum_{n=0}^{\infty} p \int_0^{\infty} e^{-rx} \frac{(-1)^n}{2n!} x^{2n} dx$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} \left[r\int_0^{\infty} e^{-rx}\, x^{2n} dx\right]$$

$$\text{let } 2n = u$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} M\,\{z^u\}$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} \frac{u!}{p^u}$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n!} \frac{2n!}{p^{2n}}$$

$$\text{Hence}, M\{f(t)\} = \sum_{n=0}^{\infty} \frac{(-1)^n}{r^{2n}}$$

G. Mahgoub Transformation of the Power series expansion of $Sinx$ later than the expanding to power series appearance $[\mathbf{4}, \mathbf{5}, \mathbf{6},]$

$$\text{Sin}x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1} = f(x)$$

$$M\{f(x)\} = M\left\{\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} X^{2n+1}\right\}$$

$$= r\int_0^{\infty} e^{-rx} \left\{\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1}\right\} dx$$

$$= \sum_{n=0}^{\infty} r \int_0^{\infty} e^{-rx} \frac{(-1)^n}{(2n+1)!} x^{2n+1} dx$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}\left[r\int_0^{\infty} e^{-rx}\, x^{2n+1} dx\right]$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} M\,\{z^{2n+1}\}$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} \frac{(2n+1)!}{r^{2n+1}}$$

$$\text{Hence, } M\{f(t)\} = \sum_{n=0}^{\infty} \frac{(-1)^n}{r^{2n+1}}$$

H. Mahgoub Transformation of the Power series expansion of $Coshx$ later than the expanding to power series appearance $[\mathbf{4}, \mathbf{5}, \mathbf{6},]$

$$\text{Coshx} = \sum_{n=0}^{\infty} \frac{1}{2n!} x^{2n} = f(x)$$

$$M\{f(z)\} = M\left\{\sum_{n=0}^{\infty} \frac{1}{2n!} x^{2n}\right\}$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=0}^{\infty} \frac{1}{2n!} x^{2n}\right\} dx$$

$$= \sum_{n=0}^{\infty} p\int_0^{\infty} e^{-rx} \frac{1}{2n!} x^{2n} dx$$

$$= \sum_{n=0}^{\infty} \frac{1}{2n!}\left[r\int_0^{\infty} e^{-rx}\, x^{2n} dx\right]$$

$$\text{let } 2n = u$$

$$= \sum_{n=0}^{\infty} \frac{1}{2n!} M\,\{x^u\}$$

$$= \sum_{n=0}^{\infty} \frac{1}{2n!} \frac{u!}{p^u}$$

$$= \sum_{n=0}^{\infty} \frac{1}{2n!} \frac{2n!}{r^{2n}}$$

$$\text{Hence, } M\{f(x)\} = \sum_{n=0}^{\infty} \frac{2n-1!}{r^{2n}}$$

I. Mahgoub Transformation of the Power series expansion of $Sinx$ later than the expanding to power series appearance [4, 5, 6,]

$$\text{Sinhx} = \sum_{n=0}^{\infty} \frac{1}{(2n+1)!} x^{2n+1} = f(x)$$

$$M\{f(z)\} = M\left\{\sum_{n=0}^{\infty} \frac{1}{(2n+1)!} x^{2n+1}\right\}$$

$$= p\int_0^{\infty} e^{-rx}\left\{\sum_{n=0}^{\infty} \frac{1}{(2n+1)!} x^{2n+1}\right\} dx$$

$$= \sum_{n=0}^{\infty} p \int_0^{\infty} e^{-rx} \frac{1}{(2n+1)!} x^{2n+1} dx$$
$$= \sum_{n=0}^{\infty} \frac{1}{(2n+1)!} r \int_0^{\infty} e^{-rx} x^{2n+1} dx$$
$$= \sum_{n=0}^{\infty} \frac{1}{(2n+1)!} M\{x^{2n+1}\}$$
$$= \sum_{n=0}^{\infty} \frac{1}{r^{2n+1}}$$

Hence, $M\{f(t)\} = \sum_{n=0}^{\infty} \frac{1}{r^{2n+1}}$

J. If f(x) is a Power Series Expansion at the Point b, where b is any Constant, b ∈ R, Its Taylor's Series Expansion [5,6] is

$$\mathbf{f(z) = \sum_{n=0}^{\infty} b_n (z - b)^n}$$

Then, The Mahgoub transformation of f(x) is given in the form of power series as

$$M\{f(x)\} = M\left[\sum_{n=0}^{\infty} b_n (x-b)^n\right]$$
$$= r \int_0^{\infty} e^{-rx} \left\{\sum_{n=0}^{\infty} b_n (x-b)^n\right\} dx$$
$$= r \sum_{n=0}^{\infty} b_n \int_0^{\infty} e^{-rx} \{(x-b)^n\} dx$$
$$= r \sum_{n=0}^{\infty} b_n \int_0^{\infty} e^{-(u+b)r} \{(u)^n\} dx$$
$$= r \sum_{n=0}^{\infty} b_n e^{-br} \int_0^{\infty} e^{-ur} \{(u)^n\} du$$
$$= \sum_{n=0}^{\infty} b_n e^{-br} \left[r \int_0^{\infty} e^{-ur} \{(u)^n\} du\right]$$
$$= \sum_{n=0}^{\infty} b_n e^{-br} M(u)^n$$
$$M \sum_{n=0}^{\infty} b_n (z-b)^n = \sum_{n=0}^{\infty} b_n e^{-br} \frac{n!}{r^n}$$

K. If f(x) is a Power Series Expansion at the Point 0, where 0, Its Power Series Expansion is [5,6,7,8,9,10,11,12,13]

$$\mathbf{f(x) = \sum_{n=0}^{\infty} b_n (x)^n}$$

Then, TheMahgoub transformation of f(x) is given in the form of power series as

$$M\{f(x)\} = M\left[\sum_{n=0}^{\infty} b_n (x)^n\right]$$

$$= r\int_0^{\infty} e^{-rx}\left\{\sum_{n=0}^{\infty} b_n\,(x)^n\right\}dx$$
$$= r\sum_{n=0}^{\infty} b_n \int_0^{\infty} e^{-rx}\,\{(x)^n\}dx$$
$$= \sum_{n=0}^{\infty} b_n\, r\int_0^{\infty} e^{-rx}\,\{(x)^n\}dx$$
$$= \sum_{n=0}^{\infty} b_n\ M(x)^n$$
$$= \sum_{n=0}^{\infty} b_n\ \frac{n!}{p^n}$$

L. Mahgoub Transformation of the Power series expansion of e^{x^2} later than the expanding to power series appearance[**14**, **15**, **16**, **17**, **18**, **19**, **20**]:

$$f(x) = \mathbf{e}^{x^2} = \sum_{\mathbf{n=0}}^{\infty} \frac{\mathbf{x^{2n}}}{\mathbf{n}!}$$
$$M[f(x)] = r\int_0^{\infty} e^{-rx}\left\{\sum_{\mathbf{n=0}}^{\infty} \frac{\mathbf{x^{2n}}}{\mathbf{n}!}\right\}dx$$
$$= \ r\sum_{n=0}^{\infty} \frac{1}{n!}\int_0^{\infty} e^{-rx}\,\{(x)^{2n}\}dx$$
$$= \sum_{n=0}^{\infty} \frac{1}{n!}\left[r\int_0^{\infty} e^{-rx}\,\{(x)^{2n}\}dx\right]$$
$$= \sum_{n=0}^{\infty} \frac{1}{n!} M(z)^{2n}$$
$$= \sum_{n=0}^{\infty} \frac{1}{n!}\frac{n!}{r^{2n}}$$
$$\sum_{n=0}^{\infty} \frac{1}{r^{2n}}$$

M. Mahgoub transformation of Convergence Series [21,22,23,24,25,26]

$$1 + \frac{c+z}{1!} + \frac{(c+2z)^2}{2!} + \frac{(c+3z)^3}{3!} + \cdots$$
$$= \sum_{n=0}^{\infty} \frac{(c+nx)^n}{n!} = f(x)$$
$$\text{So}, M\{f(z)\} = M\left\{\sum_{n=0}^{\infty} \frac{(c+nx)^n}{n!}\right\}$$
$$r\int_0^{\infty} e^{-rx}\left\{\sum_{n=0}^{\infty} \frac{(c+nx)^n}{n!}\right\}dx \quad ,$$
$$\text{let } c + nx = z$$

$$= \sum_{n=0}^{\infty} r \int_0^{\infty} e^{-rx} \frac{(c+nx)^n}{n!} dx$$

$$= \sum_{n=0}^{\infty} r \int_0^{\infty} e^{-r(\frac{z-c}{n})} \frac{z^n}{n!} \frac{dz}{n}$$

$$= \sum_{n=0}^{\infty} r\, e^{\frac{rc}{n}} \int_0^{\infty} e^{-\frac{r}{n}z} \frac{z^n}{n!} \frac{dz}{n} \quad , \quad \text{let } \frac{r}{n} = u$$

$$= \sum_{n=0}^{\infty} r\, e^{\frac{rc}{n}} \int_0^{\infty} e^{-uz} \frac{z^n}{n!} \frac{dz}{n}$$

$$= \sum_{n=0}^{\infty} e^{\frac{rc}{n}} \frac{1}{n!\; n} r \int_0^{\infty} e^{-uz} z^n dz$$

$$= \sum_{n=0}^{\infty} e^{\frac{rc}{n}} \frac{1}{n!\, n} M(z^n)$$

Hence,

$$M\left\{\sum_{n=0}^{\infty} \frac{(c+nz)^n}{n!}\right\} = \sum_{n=0}^{\infty} e^{\frac{rc}{n}} \frac{1}{nr^n}$$

IV. CONCLUSION

The main purpose of this paper is to give a brief idea about applications of Mahgoub Transform in various areas and how it is used to solve various type of problems in science and engineering. In this paper, we have found the Mahgoub Transformation of some power series and it comes out to be very foremost and effective tool to find the Mahgoub Transformation of some power series.

REFERENCES

[1] Verma Dinesh, Alam Aftab, Analysis of Simultaneous Differential Equations by Elzaki Transform Approach, Science, Technology and Development. 9(1) (2020).

[2] Shrivastava Sunil, Introduction of Laplace Transform and Elzaki Transform with Application (Electrical Circuits), International Research Journal of Engineering and Technology (IRJET). 5(02) (2018).

[3] Tarig M. Elzaki, Salih M. Elzaki and Elsayed Elnour, On the New Integral Transform Elzaki Transform Fundamental Properties Investigations and Applications, Global Journal of Mathematical Sciences: Theory and Practical. 4(1) (2012).

[4] Verma Dinesh and Gupta Rohit, Laplace Transformation Approach to Infinite Series, International Journal of Advance and Innovative Research. 6(2) (2019).

[5] Verma Dinesh, Elzaki Transformation of Some Significaknt Power Series, International Journal of Advance Research and Innovative Ideas in Education. 6(1) (2020).

[6] Verma Dinesh, Aboodh Transform Approach to Power Series by, Journal of American Science (JAS). 16(7).

[7] Shiferaw Geremew Gebede, Laplace Transform of Power Series, Impact: International Journal of Research in Applied, Natural and Social Sciences, Impact: IJRANSS. 5(3) (2017) 151-156

[8] Verma Dinesh and Rahul Gupta, Delta Potential Response of Electric Network Circuit, Iconic Research and Engineering Journal (IRE). 3(8) (2020).

[9] Gupta Rohit, Verma Dinesh and Singh Amit Pal, Double Laplace Transform Approach to the Electric Transmission Line with Trivial Leakages through Electrical Insulation to the Ground, Compliance Engineering Journal. 10(12) (2019).

[10] Gupta Rohit, Gupta Rahul and Verma Dinesh, Laplace Transform Approach for the Heat Dissipation from an Infinite Fin Surface, Global Journal of Engineering Science and Researches (GJESR). 6(2) (2019).

[11] Kumar D.S, Heat and Mass Transfer, Seventh Revised Edition, Publisher: S K Kataria and Sons. (2013).

[12] Nag P.K, Heat and Mass Transfer. 3rd Edition, Publisher: Tata McGraw-Hill Education Pvt. Ltd. (2011)

[13] Gupta Rohit, Singh Amit Pal, Verma Dinesh, Flow of Heat through A Plane Wall, and through a Finite Fin Insulated at the Tip, International Journal of Scientific & Technology Research. 8(10) (2019) 125-128.

[14] Gupta Rohit, Neeraj Pandita, Rahul Gupta, Heat Conducted through a Parabolic Fin Via Means of Elzaki Transform, Journal of Engineering Sciences. 11(1) (2020) 533-535.

[15] Gupta Rohit, On Novel Integral Transform: Rohit Transform and its Application to Boundary Value Problems, ASIO Journal of Chemistry, Physics, Mathematics and Applied Sciences. 4(1) (2020) 08-13.

[16] Gupta Rohit, Gupta Rahul, Matrix Method Approach for the Temperature Distribution and Heat Flow Along a Conducting Bar Connected between Two Heat Sources, Journal of Emerging Technologies and Innovative Research. 5(9) (2018) 210-214.

[17] Gupta Rohit, Gupta Rahul, Heat Dissipation from the Finite Fin Surface Losing Heat at the Tip, International Journal of Research and Analytical Reviews. 5(3) (2018) 138-143.
[18] Verma Dinesh and Singh Amit Pal, Importance of Power Series by Dinesh Verma Transform (DVT). ASIO Journal of Engineering & Technological Perspective Research (ASIO-JETPR). 5(1) (2020) 08-13.
[19] Verma Dinesh, Analytical Solutuion of Differential Equations by Dinesh Verma Tranforms (DVT), ASIO Journal of Chemistry, Physics, Mathematics & Applied Sciences (ASIO-JCPMAS). 4(1) (2020) 24-27.
[20] Verma Dinesh, Singh Amit Pal and Verma Sanjay Kumar, Scrutinize of Growth and Decay Problems by Verma DineshTranform (DVT), Iconic Research and Engineering Journals (IRE Journals). 3(12) (2020) 148-153.
[21] Verma Dinesh and Verma Sanjay Kumar, Response of Leguerre Polynomial via Dinesh Verma Tranform (DVT), EPRA International Journal of Multidisciplinary Research (IJMR). 6(6) (2020) 154-157.
[22] Verma Dinesh, Empirical Study of Higher Order Diffeential Equations with Variable Coefficient by Dinesh Verma Transformation (DVT), ASIO Journal of Engineering & Technological Perspective Research (ASIO-JETPR). 5(1) (2020) 04-07.
[23] Verma Dinesh, Putting Forward a Novel Integral Transform: Dinesh Verma Transform (DVT) and its Applications, International Journal of Scientific Research in Mathematical and Statistical Sciences. 7(2) (2020) 139-145.
[24] Verma Dinesh, Elzaki Transform Approach to Differential Equations, Academia Arena. 12(7) (2020) 01-03.
[25] Naulyal Govind Raj, Kumar Updesh and Verma Dinesh, Analysis of Uniform infinite Fin by Elzaki Transform, Compliance Engg. Journal. 13(3) (2022).
[26] Kumar Updesh, Naulyal Govind Raj and Verma Dinesh, Elzaki Transform to Diffrential Equations with Delta Function, New York Science Journal. 15(2) (2022).