

Journal of Ramanujan Society of Mathematics and Mathematical Sciences

J.R.S.M.A.M.S. JOURNAL (Half Yearly)

Vol. 6, No. 1, June 2017

ISSN : 2319-1023

Special Issue

Dedicated to **Prof. K. Srinivasa Rao**
(75th Birth Anniversary)



$$\sum_{n=0}^{\infty} \frac{q^{n(n-1)}}{[q; q]_n} = \frac{1}{[q^2, q^3; q^5]_{\infty}} + \frac{1}{[q, q^4; q^5]_{\infty}}$$

Published by : Ramanujan Society of Mathematics and Mathematical Sciences
Rajyashree Bhavan (Van Vihar Modh) Phoolpur, Madarpur, Jaunpur-222002 (U.P.) INDIA

Corresponding Address : Dr. S.P. Singh, Dept. of Mathematics, TDPG College, Jaunpur - 222002 (UP) INDIA

Journal of Ramanujan Society of Mathematics and Mathematical Sciences

Published by :

Ramanujan Society of Mathematics and Mathematical Sciences
Rajyashree Bhavan (Van Vihar Modh), Phoolpur, Madarpur
Jaunpur-222002 (U.P.) India

Corresponding Address :

Dr. Satya Prakash Singh,
Dept. of Mathematics, TDPG College,
Jaunpur - 222002 (UP) INDIA

Editor-in-Chief

Dr. Vijay Yadav

Department of Mathematics & Statistics,
S.P.D.T. College, Andheri (E)
Mumbai - 400059, India
E-mail : vijaychottu@yahoo.com
Tel/Mob.: 08108461316

Editorial Secretary

Dr. S.N. Singh

Department of Mathematics
T.D.P.G. College, Jaunpur-222002 (U.P.) India
E-mail : snsp39@yahoo.com
Tel/Mob.: 09451161967

Managing Editor

Dr. A.K. Singh

Department of Science & Tech.
Technology Bhavan, N.Delhi -110016
E-mail : ashokk.singh@nic.in

Secretary of Publication

Dr. Satya Prakash Singh

Department of Mathematics
T.D.P.G. College, Jaunpur-222002 (U.P.) India
E-mail : snsp39@gmail.com
Tel/Mob.: 09451159058

Editorial Board :

- Prof. B.C. Berndt, Dept. of Maths., University of Illinois, 1409, West Green St., Urbana, IL 61801, USA
- Prof. H.M. Srivastava, Professor Emeritus, Department of Mathematics and Statistics
University of Victoria, Victoria, British Columbia V8W 3R4, Canada
- Prof. S. Bhargava, Mysore
- Prof. R.K. Saxena, 34, Panch Batti Chauraha, Ratnada, Jodhpur, Rajasthan
- Prof. Mahi R. Singh, 1151 Richmond Street London, Ontario, Canada, N6A 3K7
- Prof. Pushpa N. Rathie, Federal University of Ceara, Fortaleza, CE, Brazil.
- Prof. Sundar Lal, Ex-Vice Chancellor, VBSPU, Jaunpur
- Prof. M.A. Pathan, Aligarh Muslim University, Aligarh
- Prof. R.Y. Denis, Gorakhpur University, Gorakhpur
- Prof. N.K. Thakare, Pune University, Pune
- Prof. K. Srinivasa Rao, Chennai
- Prof. K.K. Azad, Dept. of Maths., Allahabad University, Allahabad-211001
- Prof. Shaun Cooper, Institute of Information & Mathematical Sciences, Massey University,
Albany, Auckland, New Zealand
- Prof. S. Deo, Harish Chandra Research Institute, Allahabad
- Prof. P.V. Arunachalam, 526, Balaji Colony, Andhra Bank Road, Tirupati (A.P.)
- Prof. K.C. Prasad, Ranchi University, Ranchi
- Prof. U.C. De, Calcutta University, Kolkata
- Prof. Chongdar, Kolkata
- Prof. M.S. Mahadev Naika, Bangalore
- Prof. K.R. Vasuki, Mysore

ON CERTAIN TRANSFORMATIONS OF BASIC
HYPERGEOMETRIC FUNCTIONS USING
BAILEY'S TRANSFORM

Jayprakash Yadav, N.N. Pandey and Manoj Mishra*

Department of Mathematics,
Prahladrai Dalmia Lions College of Commerce and Economics,
Sundar Nagar, Malad (W), Mumbai-400064, Maharashtra, INDIA
E-mail: jayp1975@gmail.com

*Department of Mathematics,
G.N. Khalsa College, Matunga, Mumbai-400068, Maharashtra, INDIA
E-mail: mkmishra_maths@yahoo.co.in

Dedicated to Prof. K. Srinivasa Rao on his 75th Birth Anniversary

Abstract: In this paper, making use of Bailey transform and certain known summation formulas, we have established certain interesting transformation formulas of basic hypergeometric series.

Keywords and Phrases: Basic hypergeometric series, Bailey's pair and Bailey's transformation.

2010 Mathematics Subject Classification: 33D15

1. Introduction

The generalized basic hyper geometric series ${}_r\phi_s$ is defined by

$${}_r\phi_s \left[\begin{matrix} a_1, a_2, \dots, a_r \\ b_1, b_2, \dots, b_s \end{matrix} ; q, z \right] = \sum_{n=0}^{\infty} \frac{(a_1, a_2, \dots, a_r)_n}{(q, b_1, b_2, \dots, b_s)_n} [(-1)^n q^{n(n-1)/2}]^{1+s-r} z^n \quad (1.1)$$

where r and s are positive integers and $|q| < 1$. The above series converges absolutely for all z if $r \leq s$ and for $|z| < 1$ if $r = s + 1$.

For real or complex a , $q < 1$, the q -shifted factorial is defined by

$$(a, q)_n = \begin{cases} 1 & \text{if } n = 0; \\ (1-a)(1-aq)(1-aq^2) \dots, (1-aq^{n-1}) & \text{if } n \in N. \end{cases} \quad (1.2)$$

In 1947, Bailey established a remarkably simple and useful transformation formula which is given in the following form:

If

$$\beta_n = \sum_{r=0}^n \alpha_r u_{n-r} v_{n+r} \quad (1.3)$$

and

$$\gamma_n = \sum_{r=0}^{\infty} \delta_{r+n} u_r v_{r+2n} \quad (1.4)$$

where α_r, δ_r, u_r and v_r are functions of r only such that the series of γ_n exists, then under suitable conditions of convergence we have the following equation.

$$\sum_{n=0}^{\infty} \alpha_n \gamma_n = \sum_{n=0}^{\infty} \beta_n \delta_n \quad (1.5)$$

In this paper, we shall use the following results due to Verma and Jain [10].

$$\begin{aligned} & {}_4\Phi_3 \left[\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, q^{-n}; -q^{-1/2+n} \\ \sqrt{a}, -\sqrt{a}, aq^{1+n} \end{matrix} \right] \\ &= \frac{(aq; q)_n}{2} \left[\frac{(-q^{-1/2}; q)_n}{(\sqrt{aq}; q)_n (-q\sqrt{a}; q)_{n-1}} + \frac{(-q^{-1/2}; q)_n}{(-\sqrt{aq}; q)_n (q\sqrt{a}; q)_{n-1}} \right] \end{aligned} \quad (1.6)$$

$${}_3\Phi_2 \left[\begin{matrix} a, q\sqrt{a}, q^{-n}; -q^n \\ \sqrt{a}, aq^{1+n} \end{matrix} \right] = \frac{(aq, -1; q)_n}{2} \left[\frac{(1 + \sqrt{a})}{(aq; q^2)_n} + \frac{(1 - \sqrt{a})}{(\sqrt{a}; q)_n (-q\sqrt{a}; q)_n} \right] \quad (1.7)$$

$$\begin{aligned} & {}_2\Phi_1 \left[\begin{matrix} a, q^{-n}; -q^{1/2+n} \\ aq^{1+n} \end{matrix} \right] \\ &= \frac{(aq, -\sqrt{q}; q)_n}{2} \left[\frac{(1 + \sqrt{a})}{(-\sqrt{aq}; q)_n (q\sqrt{a}; q)_n} + \frac{(1 - \sqrt{a})}{(\sqrt{aq}; q)_n (-q\sqrt{a}; q)_n} \right] \end{aligned} \quad (1.8)$$

2. Main Results

In this section we shall establish the following results.

$${}_5\Phi_5 \left[\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, c; q; \frac{-a\sqrt{q}}{bc} \\ \sqrt{a}, -\sqrt{a}, qa/b, qa/c, 0 \end{matrix} \right] = \frac{1}{2} \prod \left[\begin{matrix} aq, aq/bc; q \\ aq/b, aq/c \end{matrix} \right] \times$$

$$\left\{ \begin{aligned} & {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{a}; q; aq/bc \\ \sqrt{aq}, -q\sqrt{a} \end{matrix} \right] + \sqrt{a} {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{a}; q; a^{3/2}q^2/bc \\ \sqrt{aq}, -q\sqrt{a} \end{matrix} \right] \\ & + {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{q}; q; aq/bc \\ -\sqrt{aq}, q\sqrt{a} \end{matrix} \right] - \sqrt{a} {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{q}; q; a^{3/2}q^2/bc \\ -\sqrt{aq}, q\sqrt{a} \end{matrix} \right] \end{aligned} \right\} \quad (2.1)$$

$${}_4\Phi_4 \left[\begin{matrix} a, q\sqrt{a}, b, c; q; -aq/bc \\ \sqrt{a}, aq/b, aq/c, 0 \end{matrix} \right] = \frac{1}{2} \prod \left[\begin{matrix} aq, aq/bc; q \\ aq/b, aq/c \end{matrix} \right] \times$$

$$\left\{ (1 + \sqrt{a}) {}_3\Phi_2 \left[\begin{matrix} b, c, -1; q; \frac{aq}{bc} \\ \sqrt{aq}, -\sqrt{aq} \end{matrix} \right] + (1 - \sqrt{a}) {}_3\Phi_2 \left[\begin{matrix} b, c, -1; q; \frac{aq}{bc} \\ \sqrt{a}, -q\sqrt{a} \end{matrix} \right] \right\} \quad (2.2)$$

$${}_3\Phi_3 \left[\begin{matrix} a, b, c; q; \frac{-aq^{3/2}}{bc} \\ aq/b, aq/c, 0 \end{matrix} \right] = \frac{1}{2} \prod \left[\begin{matrix} aq, aq/bc; q \\ aq/b, aq/c \end{matrix} \right] \times$$

$$\left\{ {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{q}; q; aq/bc \\ -\sqrt{aq}, \sqrt{aq} \end{matrix} \right] + {}_3\Phi_2 \left[\begin{matrix} b, c, -\sqrt{q}; q; aq/bc \\ -\sqrt{a}, q\sqrt{a} \end{matrix} \right] \right\} \quad (2.3)$$

$${}_7\Phi_7 \left[\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, c, d, e; q; \frac{a^2q^2}{bcde} \\ \sqrt{a}, -\sqrt{a}, qa/b, qa/c, aq/d, aq/e, 0 \end{matrix} \right]$$

$$= \frac{(aq, aq/de; q)_\infty}{(aq/d, aq/e; q)_\infty} {}_3\phi_2 \left[\begin{matrix} a, e, aq/bc; q; \frac{aq}{de} \\ aq/b, aq/c \end{matrix} \right] \quad (2.4)$$

Proof of (2.1):

Let us choose $u_r = \frac{1}{(q; q)_r}$, $v_r = \frac{1}{(aq; q)_r}$, $\alpha_r = \frac{(a, q\sqrt{a}, -q\sqrt{a}; q)_r q^{r(r-1)/2}}{(q, \sqrt{a}, -\sqrt{a}; q)_r q^{r/2}}$,

and $\delta_r = (b, c; q)_r \left(\frac{aq}{bc}\right)^r$

Now using these in equations (1.2), (1.3) and using (1.6) we get the following:

$$\beta_n = \frac{(-q^{-1/2}; q)_n}{2} \left\{ \frac{1 + q^n \sqrt{a}}{(q, \sqrt{aq}, -q\sqrt{a}; q)_n} + \frac{1 - q^n \sqrt{a}}{(q, -\sqrt{aq}, q\sqrt{a}; q)_n} \right\} \quad (2.5)$$

and

$$\gamma_n = \frac{(b, c; q)_n}{(aq; q)_n} \left(\frac{aq}{bc}\right)^n {}_2\phi_1 \left[\begin{matrix} bq^n, cq^n; q; \frac{aq}{bc} \\ aq^{1+2n} \end{matrix} \right] \quad (2.6)$$

Summing the series ${}_2\phi_1$, we have:

$$\gamma_n = \frac{(b, c; q)_n}{(aq/b, aq/c; q)_n} \left(\frac{aq}{bc}\right)^n \prod \left[\begin{array}{c} aq/b, aq/c; q \\ aq, aq/bc \end{array} \right] \quad (2.7)$$

Putting these values in equation (1.5), we get the proof of (2.1).

Proof of (2.2):

$$\text{Let us choose } u_r = \frac{1}{(q; q)_r}, v_r = \frac{1}{(aq; q)_r}, \alpha_r = \frac{(a, q\sqrt{a}; q)_r q^{r(r-1)/2}}{(q, \sqrt{a}; q)_r},$$

$$\text{and } \delta_r = (b, c; q)_r \left(\frac{aq}{bc}\right)^r$$

Now using these in equations (1.2), (1.3) and using (1.7) we get the following:

$$\begin{aligned} \beta_n &= \frac{1}{(q, aq; q)_n} {}_3\Phi_2 \left[\begin{array}{c} a, q\sqrt{a}, q^{-n}; -q^n \\ \sqrt{a}, aq^{1+n} \end{array} \right] \\ &= \frac{(-1; q)_n}{2(q; q)_n} \left\{ \frac{1 + \sqrt{a}}{(aq; q^2)_n} + \frac{1 - \sqrt{a}}{(\sqrt{a}, -q\sqrt{a}; q)_n} \right\} \end{aligned} \quad (2.8)$$

and

$$\gamma_n = \frac{(b, c; q)_n}{(aq; q)_n} \left(\frac{aq}{bc}\right)^n {}_2\phi_1 \left[\begin{array}{c} bq^n, cq^n; q; \frac{aq}{bc} \\ aq^{1+2n} \end{array} \right] \quad (2.9)$$

Summing the series ${}_2\phi_1$, we have:

$$\gamma_n = \frac{(b, c; q)_n}{(aq/b, aq/c; q)_n} \left(\frac{aq}{bc}\right)^n \prod \left[\begin{array}{c} aq/b, aq/c; q \\ aq, aq/bc \end{array} \right] \quad (2.10)$$

Putting these values in equation (1.5), we get the proof of (2.2)

Proof of (2.3):

$$\text{Let us choose } u_r = \frac{1}{(q; q)_r}, v_r = \frac{1}{(aq; q)_r}, \alpha_r = \frac{(a; q)_r q^{r^2/2}}{(q; q)_r}, \text{ and } \delta_r = (b, c; q)_r \left(\frac{aq}{bc}\right)^r$$

Now using these in equations (1.3), (1.4) and using (1.8) we get the following:

$$\beta_n = \frac{(-\sqrt{q}; q)_n}{2(q; q)_n} \left\{ \frac{1 + \sqrt{a}}{(-\sqrt{aq}, q\sqrt{a}; q)_n} + \frac{1 - \sqrt{a}}{(\sqrt{aq}, -q\sqrt{a}; q)_n} \right\} \quad (2.11)$$

and

$$\gamma_n = \frac{(b, c; q)_n}{(aq; q)_{2n}} \left(\frac{aq}{bc}\right)^n {}_2\phi_1 \left[\begin{array}{c} bq^n, cq^n; q; \frac{aq}{bc} \\ aq^{1+2n} \end{array} \right] \quad (2.12)$$

Summing the series ${}_2\phi_1$, we have:

$$\gamma_n = \frac{(b, c; q)_n}{(aq/b, aq/c; q)_n} \left(\frac{aq}{bc}\right)^n \prod \left[\begin{matrix} aq/b, aq/c; q \\ aq, aq/bc \end{matrix} \right] \quad (2.13)$$

Putting these in equation (1.5), we get the proof of (2.3)

Proof of (2.4):

In order to prove (2.4) we shall use the following summation formulae:

$${}_6\phi_5 \left[\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, c, q^{-n}; q; \frac{aq^{1+n}}{bc} \\ \sqrt{a}, -\sqrt{a}, qa/b, qa/c, aq^{1+n} \end{matrix} \right] = \frac{(aq, aq/bc; q)_n}{(aq/b, aq/c; q)_n} \quad (2.14)$$

$${}_2\phi_1 \left[\begin{matrix} a, b; q; \frac{c}{ab} \\ c \end{matrix} \right] = \frac{(c/a, c/b; q)_\infty}{(c, c/ab; q)_\infty} \quad (2.15)$$

Let us choose

$$u_r = \frac{1}{(q; q)_r}, v_r = \frac{1}{(aq; q)_r}, \alpha_r = \frac{(a, q\sqrt{a}, -q\sqrt{a}, b, c; q)_r q^{r(r+1)/2}}{(q, \sqrt{a}, -\sqrt{a}, aq/b, aq/c; q)_r} \left(\frac{-a}{bc}\right)^r,$$

and $\delta_r = (d, e; q)_r \left(\frac{aq}{de}\right)^r$

Now using these in equations (1.3) and (1.4) we get the following:

$$\beta_n = \frac{1}{(q, aq; q)_n} {}_6\phi_5 \left[\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, c, q^{-n}; q; \frac{-aq^{1+n}}{bc} \\ \sqrt{a}, -\sqrt{a}, qa/b, qa/c, aq^{1+n} \end{matrix} \right] \quad (2.16)$$

Now summing the series ${}_6\phi_5$ using equation (2.14), we get:

$$\beta_n = \frac{(aq/bc; q)_n}{(q, aq/b, aq/c; q)_n} \quad (2.17)$$

and

$$\gamma_n = \frac{(d, e; q)_n}{(aq; q)_{2n}} \left(\frac{aq}{de}\right)^n {}_2\phi_1 \left[\begin{matrix} dq^n, eq^n; q; \frac{aq}{de} \\ aq^{1+2n} \end{matrix} \right] \quad (2.18)$$

Summing the series ${}_2\phi_1$ using equation (2.15) we have:

$$\gamma_n = \frac{(d, e; q)_n}{(aq/d, aq/e; q)_n} \frac{(aq/d, aq/e; q)_\infty}{(aq, aq/de; q)_\infty} \left(\frac{aq}{de}\right)^n \quad (2.19)$$

Putting these values in equation (1.5), we get the proof of (2.4)

Acknowledge:

The authors are thankful to Dr. S.N. Singh, Ex. reader and Head, Department of Mathematics, T.D.P.G. College, Jaunpur (U.P.), INDIA, for his noble guidance during the preparation of this paper

References

- [1] Agarwal, R.P.(1996), Resonance of Ramanujan's Mathematics, Vol.II, New Age International(P)Limited, New Delhi.
- [2] Andrews, G.E. and Berndt, B.C.(2005), Ramanujan's Lost Notebook, Part 1, Springer, New York.
- [3] A.M. Mathai and R.K. Saxena, Generalized Hypergeometric Functions With Applications in Statistics and Physical Sciences, Springer-Verlag, Berlin (1973).
- [4] Andrews, G.E., Askey R. and Roy, Ranjan, Special Functions, Cambridge University Press, Cambridge, 1999.
- [5] Gasper, G. and Rahman, M.(1990), Basic hypergeometric series, Cambridge University Press, Cambridge.
- [6] Karlsson, P.W., Hypergeometric functions with integral parameter difference, *J. Math. Phys.* 12(1971), 270-271.
- [7] Slater, L.J.(1966), Generalized hypergeometric functions, Cambridge University Press, Cambridge.
- [8] Singh, S.N., Singh, S.P. and Yadav, Vijay, On Bailey's Transform and Expansion of Basic Hypergeometric Functions II, *South East Asian Journal of Mathematics and Mathematical Sciences*, Vol. 11, No. 2, 2015, pp. 37-46.
- [9] Singh, S.N., Badesara, Sonia, Bailey Transform, WP-Bailey pairs and q-series transformations, *J. of Ramanujan Society of Maths & Math. Sc.*, Vol. 2, No. 1, 2013, pp. 85-92.
- [10] Verma, A. and Jain, V. K., Certain summation formulae for q-series, *Jour. Indian Math. Soc.*, Vol. 47 (1983), p. 71-85.

JOURNAL OF RAMANUJAN SOCIETY OF MATHEMATICS AND MATHEMATICAL SCIENCES

The Journal of Ramanujan society of Mathematics and Mathematical Sciences is devoted to the publication of original research work of high quality in all areas of Mathematics and Mathematical Sciences and shall publish one volume of two numbers each year. Papers intended for publication in the Journal should be submitted in duplicate along with the electronic file (prepared in Page Maker / MS word Editor / Latex preferably) of the paper to the Editor in Chief or Editorial secretary in double space, with title, author(s) name(s), abstract and subject classification. Name(s) and address (es) of the author(s) should be given below the title of the paper, References should be numbered and listed in alphabetical order at the end of the article with serial number in the manuscript as given below;

1. **Hardy, G.H.:** S. Ramanujan, twelve lectures on the subject suggested by his life and work, 1940, Cambridge Univ. Press.
2. **Maddox, I.M.:** Spaces of strongly summable sequences Quart. J. Math. (Oxford) (2), 18 (1967), 345-355.

A contribution towards the cost of publication of papers accepted in the journal, at rate of Rs. 400 (US \$15) per printed page shall be charged. The authors are requested to arrange from their institution or publication grants under their research schemes. The (senior) author will get 10 reprints of the published paper. The price of each number of the journal will be Rs. 500.00 in India and US \$ 100 elsewhere. The order for the copy (copies) of the journal along with the amount may be sent to the Editor-in-chief by demand draft favoring *Ramanujan Society of Mathematics and Mathematical Sciences* and payable at Jaunpur (INDIA) at the address given above.

Statement about ownership and other particulars about Journal of Ramanujan Society of Mathematics and Mathematical Sciences.

Place of Publication	: Rajyashree Bhavan (Van Vihar Modh) Phoolpur, Madarpur, Jaunpur - 222002 (U.P.) INDIA
Periodicity of its Publication	: Twice a year
Printer, Publisher and Owner	: Ramanujan Society of Mathematics and Mathematical Sciences, Rajyashree Bhavan (Van Vihar Modh) Phoolpur, Madarpur, Jaunpur - 222002 (U.P.) INDIA
Editor Name	: Dr. Vijay Yadav
Nationality	: Indian
Address for correspondance	: Dr. S.P. Singh, Dept. of Mathematics, TDPG College Jaunpur - 222002 (U.P.) INDIA
E-mail Address	: jrsmams@yahoo.com, jrsmams@gmail.com
Website	: http://www.rsmams.org
Press	: Media Computer, Jaunpur (U.P.)

I, Vijay Yadav here by declare that particulars given are true to the best of my knowledge and belief.

Dated : June, 2017

Dr. Vijay Yadav
Editor

**Journal of Ramanujan Society of Mathematics
and Mathematical Sciences**

ISSN : 2319-1023

Volume 6, No. 1, June 2017

C O N T E N T S

1. A Direct Proof of the AAB-Bailey Lattice Caihuan Zhang and Zhizheng Zhang	01-06
2. On The Generalized Gamma-generated Distributions and Applications Pushpa N. Rathie and Paulo H.D. Silva	07-24
3. A Variant of the Type-1 Beta and Dirichlet Integrals A.M. Mathai	25-40
4. Certain Class of Eulerian Integrals with the Multivariable I-function defined by Nambisan F.Y. Ayant	41-52
5. Hierarchies of Palindromic Sequences in the Symmetric Group S_n K. Srinivasa Rao and Pankaj Pundir	53-62
6. A Note on Fractional Derivative and its Applications Satya Prakash Singh, Vijay Yadav and Priyanka Singh	63-70
7. On Certain Transformation Formulas Involving q-hypergeometric Series Bindu Prakash Mishra, Sunil Singh and Mohammad Shahjade	71-78
8. On Continued Fractions and Lambert Series G.S. Pant and V.P. Pande	79-90
9. On Certain Transformations of Basic Hypergeometric Functions Using Bailey's Transform Jayprakash Yadav, N.N. Pandey and Manoj Mishra	91-96
10. Common Fixed Point Theorems for Weakly Compatible Mappings in Dislocated Metric Space Vishnu Bairagi, V.H. Badshah and Aklesh Pariya	97-106
11. A Short Review of Estimation of Population Variance Through Ratio Estimators Subhash Kumar Yadav and Himanshu Pandey	107-116
12. Decimal Expansions : Their Uniqueness and Interesting Patterns Vishnu K Gurtu	117-120
13. Transfer Matrix Method for One-Dimensional Photonic Crystals J.P. Pandey	121-130
14. Two Phase Structure of the Condensation Boundary Layer on an Accelerated Plate Shubha Devi Yadav	131-144
15. Some Recent Advances in Number Theory P.V. Arunachalam	145-156
16. Use of Mathematical Models in Agricultural Economics Analysis O.P. Singh, Nagendra Singh, B.P. Singh and Devendra Singh	157-162