DEPARTMENT OF MATHEMATICS

D.S College Katihar , 854105

(A CONSTITUENT UNIT OF PURNEA UNIVERSITY,PURNIA)

The Mathematics Department at D.S College , Katihar, was established in 1953, concurrently with the founding of the college. Initially, the department focused on undergraduate studies. Later, postgraduate programs were introduced.

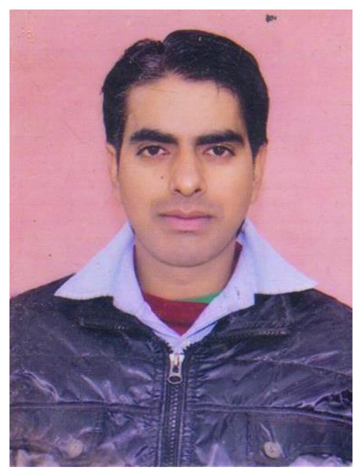
Currently, the department offers undergraduate courses, including MJC, MIC, MDC and MIL along with postgraduate programs.

FACULTY MEMBERS:-

1. Dr. Bibeka Nand Swami, Assistant Professor (HOD).
2. Dr. Ranjit Kumar Das, Assistant Professor.

PHOTOGRAPH OF EACH FACULTY MEMBER:-

Dr. Bibeka Nand Swami



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The thesis entitled "**SOME PROBLEMS OF INDETERMINATE ANALYSIS**" deals with integral solutions of certain equations.

Chapter 1: (Linear Diophantine Equation in two 'or' more variables)

Demonstrates the existence of integral solution of the equation ax + byc by residue consideration and uses it to find a particular solution of this equation, which is a deviation from the known method of using properties of continued fraction. Deviating from the known method using a particular solution of $ax + by = c$ in order to find a general formula for all its integral solution. It is shown how its solution can be obtained without knowledge of particular solution of the equation. Some theorems regarding positive integral solutions of the above equation are proved which appears to be new. The chapter ends with proving a theorem in order to find all integral solutions of $ax + by + cz = n$ with $(a, b) = 1$, where a, b, c, n are given integers.

Chapter II (Concordant and Disconcordant Forms.)

Indicates that the concordant and disconcordant forms, that is the integral solutions of the simultaneous equations.

$x^2 + m y^2 = z^2, x^2 + n y^2 = \omega^2$....(A) whose m, n are given integers. Some cases in which (A) is solvable with $y \neq 0$, in the form $x^2 + m * y$

^{2}, $x^2 + n y^2$ are concordant are indicated. As a consequence a parametric solution of the equation $x_{1}^2 + d y_{1}^2 = x_{2}^2 + d y_{2}^2$ has been obtained. Some cases in which the system(A) is impossible in integers i.e. the forms $x^2 + m y^2$, $x^2 + n y^2$ are disconcordant are proved using consequence consideration and Fermat's method of infinite descent.

Chapter III (Quartic Equation with only Trival Integer Solutions)

Considers some quartic equations having no non trivial integer solutions. Four interesting theorems are proved regarding diophantine impossibilities of equations of the type

$$a x^4 + b x^2 y^2 + c y^4 = z^2$$

The proofs are based on congruence considerations and Fermat's method of infinite descent. The chapter ends with deducing a consequence of Fermat's last theorem proved recently.

Chapter IV (Some single equation of second degree)

Discusses methods of solving many second degree equations of special type. The indicated use of trigonometry in solving the equation $x^2 + axy + b * y^2 = z^2$ is of general significance in such as it leads to solution of some known equations by particularizing a and b. Thus $a = 0$, $b = 1$, we have obtained all solutions of the well known Pythagorean equation $x^2 + y^2 = z^2$, other particular cases are also of great interest. The more general equation $a * x^2 + bxy + c * y^2 = d * z^2$ has also been treated when one particular solution of this equation is known, and the method has been solved by using the theory of S.C.F. Instances have been given that many equations can be readily proved to be impossible by using simple modulus consideration.

Method of solving

$x^2 + (x + 1)^2 + \dots\dots\dots + (x+n-1)^2 = y^2 + (y + 1)^2 + \dots\dots\dots + (y+n)^2$

by using of Pell's equation is a very interesting results.

The last Chapter V (Some Exponential Equation.)

Proves that

(i) The equation $x^y = y^x$ has only the positive integral solution $x = 4$, $y = 2$ and also finds all positive rational solutions $x > y > 1$ of this equations

(ii) The equation $13^x - 3^y = 10$ has exacts two positive integral solutions $(x, y) = (1, 1), (3, 7)$

(iii) The equation $2^x + 11^y = 5^z$ has only the integral solutions $(x, y) =(2, 0, 1), (2, 2, 3)$ and

The equation $2^x + 5^y = 11^z$ has no integral solutions.

I am grateful to my learned supervisor Prof. (Dr.) D.N.Singh, Head of the University Deptt. of Mathematics, T. M. Bhagalpur University, Bhagalpur for his assistance and guidance in the preparation of this thesis. I also had the good opportunity of freely consulting some other experts including Dr. T. N. Sinha, D.Sc., Retd. University Professor of Mathematics, T. M. Bhagalpur University, Bhagalpur.

PUBLISHED BOOKS:-

- Some Exponential Equation, IJRAR Gujarat, INDIA, Journal No.- 43602, *VOLUME* 7, Issue 4.
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- Concordant Forms, IJRAR, E-ISSN 2348-1269, P-ISSN 2349-5138.

- Linear Diophantine Equation in Two or More Variables, SHODH PRERAK, VEER BAHADUR SEVA SANSTHA LUCKNOW, *VOLUME* 8, Issue 3.
- Discordant Forms, Annals of Multi-Disciplinary Research, ISSN 2249-8893, Allahabad, *VOLUME* 8, Issue 1.