

Kanya Mahavidyalaya Kharkhoda (Sonipat)

National Seminar

On

“Emerging Trends in Sports Sciences, Yoga and Physical Education”

Feb 04, 2017

Under the auspicious of

Directorate of Higher Education, Haryana

Respected Sir/Madam

It is our privilege to invite you to KMK to attend one day seminar to be organised by department of Physical Education on **“Emerging Trends in Sports Sciences, Yoga and Physical Education”** sponsored by Directorate of Higher Education, Haryana. A plethora of academicians, practitioners, research scholars and students will be present to ruminate on the topic. We invite you to participate and contribute in the seminar to make it a success.

Every human being has a fundamental right of access to physical education and sport, which are essential for the full development of his personality. The freedom to develop physical, intellectual and moral powers through physical education and sport must be guaranteed both within the educational system and in other aspects of social life.

Yoga and sports Science is a revolution in yoga and sports. Modern athletes increasingly demand more innovative and holistic training methods to give them the edge.

The seminar will also apprise them of the latest Emerging Trends in Sports, Yoga and Physical education such interactions among persons from different fields sharing their experiences. Expertise, ideas, innovations and researchers will indeed explore better to face the Emerging Challenges in the concerned areas. During this interaction among people, the outcome of it would help understanding Indian and International issues in a comprehensive manner, exploring strategies to address them.

About The College

Kanya Mahavidyalaya, Kharkhoda is one of the premier institution of MDU Rohtak established in 1993 having versatile and highly qualified faculty sustaining the torch of knowledge in discipline.

The college is situated in rural heart-land of Haryana and is conveniently accessible to the girls of the area. The college is making an ardent effort for providing quality education. KMK is running UG and PG courses in Arts, Commerce, Computer Science & P.G. Diploma in Yoga Science stream. Moreover, our student excels in sports at National and International level and brings laurels to our college every year.

Our college stimulates intelligence and aids the development of such social virtues as Co-operation, helpfulness and responsibility. The college is striving to empower and groom the rural students in the present competitive scenario.

Objectives: The main objectives of the seminar are:

- The seminar aims to promote a meaningful interaction on ideas pertaining to issues in Financial Sector among leading academicians, researchers, educators and students.
- It would serve as a common platform to discuss the issues, problems and challenges related to financial sector.
- The interaction would help in understanding Indian and international issues in a comprehensive manner consequently exploring strategies to address them.
- The seminar would provide researches a platform to discuss how and where these issues fit into research work.

Call for Papers

Sub- Topics:

The topics of the seminar would include but not restricted to:

- Recent advancements in Yogic Teaching
- Benefits of Sport Sciences
- Prevention of Drug Abuse in Sports
- Modern tool for Talent Identification in Sports
- Sports Biomechanics
- Sports and Psycho-Physiology
- Sports Management
- Sports Sociology
- Education and Sports
- Sports Physiotherapy
- Sports Medicine

- Professional Knowledge and Technical Skills
- Adoption of Latest Rules for Tournaments
- Adapted Physical Education
- E-Commerce and Sports
- Sports Journalism
- Role of IT in Sports Science

Each participant is requested to send a soft copy of the abstract and full paper as per guidelines at sportssemi2017@gmail.com

Guidelines for Submission of abstract and full paper

Abstract	Full Paper
Title Page: Title, Author(s), Institution Details, Contact Details, Email Address	Format- A-4 size, MS word
Font: Times New Roman Font Size: 12 Line Spacing: 1	Font: Times New Roman Font Size: 12 Line Spacing: 1
Word Limit: 250 to 300 Key Words: 3 to 5	Word Limit: 2000 to 3000 Key Words: 3 to 5

Important Dates

Abstract Submission	December 15, 2016
Submission of Full Paper	January 05, 2017
Registration	February 04, 2017

Registration:

Faculty: Rs. 500/

Research Scholars and Students: Rs 300/

No TA/DA will be paid to participants.

Registration fee is not refundable

MAHARSHI DAYANAND UNIVERSITY ROHTAK

No. CB-IV/2013/

Dated: _____

Spred path-

To.

The Joint Secretary (NRCB),
University Grant Commission,
Northern Regional College Bureau,
35 Feroze Shah Road, New Delhi-110001

Sub: **Proposal for Minor Research Project.**

Sir,

I am directed to enclose herewith the proposal of minor research project of Ms. Sushm Devi, Lecturer in Math, submitted by The Principal, Kanya Mahavidyalya, Kharkhoda, Dist Sonapat duly recommended by the Dean College Development council, M.D. University, Rohta for further necessary action.

Yours Faithfully,

Encls: as above

De Superintendent (College
For DCDC

✓ Endst. No. CB-IV/2013/ 32191

Dated: 26-12-

✓ Copy of the above is forwarded to The Principal, Kanya Mahavidyalya, Kharkhod Distt. Sonapat, Haryana for information and necessary action w.r.t. his office letter n KMK/5314 dated 21-12-2013.

De Superintendent (Colleges
For DCDC



Kanya Mahavidyalaya

Kharkhoda Distt. Sonapat (Haryana)

Ph. : 01

Fax : 01

e-mail : kanyamahavidyalaya

kmkharkhoda@gmail.com

Website : www.kmkharkhoda.org

Ref. No. Kmk/5326

Dated 09-12-2013

To

The Joint Secretary
(NRCB), 35- Feroze Shah Road
New Delhi-110001

Sub:- Regarding Minor Research Project.

R/Sir,

In continuation to our letter No. KMK/5314 dated 21.12.2013 sent to M.D.University Rohtak regarding Minor Research Project in the subject of Mathematics entitled "Fixed Point Theory and Stability of Functional Equations in Various Spaces" by Dr. Sushma (Assistant professor, Kanya Mahavidyalaya, Kharkhoda Distt. Sonapat, Haryana). The Assessment certificate is attached herewith for your kind perusal.

Thanking you.

Yours sincerely,

Principal

Kanya Mahavidyalaya
Kharkhoda

Annexure-VIII

UNIVERSITY GRANT COMMISSION

BAHADUR SHAH ZAFAR MARG

NEW DELHI-110002

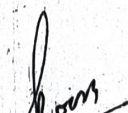
(Assessment Certificate)

It is certified that the proposal entitled "Fixed Point Theory and Stability of Functional Equations in Various Spaces" by Dr. Sushma (Assistant professor, Kanya Mahavidyalaya, Kharkhoda Distt. Sonapat, Haryana) Deptt. Of Mathematics has been assessed by the expert committee consisting the following members for submission to the UGC Regional office Northern Regional College Bureau (NRCB) at 35 Feroze Shah Road, New Delhi-110001 for financial support under the scheme of Minor Research Projects:

Details of Expert Committee:

1. Dr. Seema Mehra Berwal, Assistant Professore, M.D.University, Rohtak.
2. Dr. Savita Rathii, Assistant Professore, M.D.University, Rohtak.

The proposal is as per the guidelines.


(Principal)
Principal
Kanya Mahavidyalaya
Seal
Kharkhoda

PROPOSAL FOR MINOR RESEARCH PROJECT

PROPOSAL FOR MINOR RESEARCH PROJECT

PART-A

1. Broad Subject : *Mathematics*
2. Area of Specialization : *Functional Analysis,
Fuzzy Mathematics*
3. Duration : *24 months*
4. Principal Investigator
 - i. Name : *Dr. Sushma*
 - ii. Sex : *Female*
 - iii. Date of Birth : *15-02-1984*
 - iv. Category : *General*
 - v. Qualification : *M.Sc., Ph.D., NET*
 - vi. Designation : *Assistant Professor*
 - vii. Address
 - Office : *Kanya Mahavidyalaya Kharkhoda
Distt. Sonapat-131402. (Haryana)*
 - Residence : *769/21, Prem Nagar, Rohtak-124001
(Haryana), Mob: 09466476402*
 - Email : *lathersushma@yahoo.com*
5. Name of the institution where the project will be undertaken:
 - a. Department : *Department of Mathematics*
 - b. College : *Kanya Mahavidyalaya Kharkhoda
Distt. Sonapat-131402. (Haryana)*
 - c. Affiliating University : *M.D. University, Rohtak.*
 - d. Whether the institute is located in rural/urban area: *Rural area*
6. Whether the University/College/Institution is approved under Section 2(f) and 12(B) of the UGC Act: *Yes.*

PROPOSAL FOR MINOR RESEARCH PROJECT

7. Teaching and research experience of Principal Investigator

a. Teaching Experience : UG : $3\frac{1}{2}$ years

PG: 2 years

b. Research experience : $5\frac{1}{2}$ years

c. Publication(Last Five years) :
Papers Published : 09 (Please see Annexure I)

PROPOSAL FOR MINOR RESEARCH PROJECT

PART-B

Proposed Research Work

8 (i) Project Title : **Fixed Point Theory And Stability Of Functional Equations**

In Various Spaces.

(ii) Introduction

- Origin of the Research Problem

Functional analysis is an abstract branch of Mathematics that originated from classical analysis. Its development started about eighty years ago, and now-a-days functional analytic methods and results are important in various fields of mathematics and its applications. Besides metric spaces, the most important parts in functional analysis are normed linear spaces, inner product spaces, generalised spaces and inequalities on these spaces. Fixed point theory has fascinated hundreds of researchers since 1922 with the celebrated Banach's fixed point theorem. There exists a vast literature on this topic and this is a very active field of research at present. Over the past few decades, specifically, fixed point theory have been shown to be useful in a large number of applications. Many equations which are of interest in applications occur (or can be put) in the form $Tx = x$, where T is mapping from a metric space X into itself. A point x which satisfies $Tx = x$ is called quite naturally, a fixed point of the mapping T .

Fixed point theorems are powerful tools in not only mathematics but also economics. In some economic problems, we need not real-valued but integer-valued equilibria. However, classical fixed point theorems guarantee only real-valued equilibria. So we need discrete fixed point theorems in order to get discrete equilibria. For a long period, the Schauder-Tychonoff fixed point theorem has been a very useful tool for the study of differential and integral equations and other fields. The Kakutani theorem and its generalizations were applied to game theory, mathematical economics, systems and control theory, coincidence theory, minimax theory, variational inequalities, convex analysis, and many equilibrium theorems.

The first result of fixed point theorem is known as Banach fixed point theorem or Banach Contraction Principle.

"Let X be any non empty set and (X,d) be a complete metric space . If T is mapping of X into itself satisfying $d(Tx,Ty) \leq k d(x,y)$ (called Banach contraction) for each $x,y \in X$ where $0 \leq k < 1$, then T has a unique fixed point in X ." If X is not a complete space, then f may not have a fixed point. e.g Let $f : (0, 1) \rightarrow (0, 1)$ be given by $fx = x/2$. Then $f(0) = 0$ but 0 does not belongs to $(0, 1)$. If f is not a contraction function on a complete metric space X , then f may not have a fixed point. e.g A translation map on \mathbb{R} does not have a fixed point.

In 1912, Brouwer [4] proved the first result on fixed points as

PROPOSAL FOR MINOR RESEARCH PROJECT

Let C be the unit ball in \mathbb{R}^n and $T : C \rightarrow C$ a continuous function. Then T has a fixed point in C (or $Tx = x$ has a solution).

The particular case of this result on the real line can be stated in the following way:

Let $T : [0,1] \rightarrow [0,1]$ be a continuous function. Then T has a fixed point.

Kakutani[21] produced an example that the above result does not hold, in general, for infinite dimensional spaces. Brouwer's theorem was extended to infinite dimensional spaces by Schauder[36] in 1930 in the following way.

Let X be a Banach space, C a compact convex subset of X and $T : C \rightarrow C$ a continuous map. Then T has at least one fixed point in C .

The compactness condition in C is a strong one. Many problems in analysis do not have a compact setting. It is natural to modify the theorem by relaxing the condition of compactness.

Functional equation: In mathematics and particularly in functional analysis, a functional is traditionally a map from a vector space to the field underlying the vector space, which is usually the real numbers. In other words, it is a function which takes for its input-argument a vector and returns a scalar. Commonly the vector space is a space of functions, thus the functional takes a function for its input-argument, and then it is sometimes considered a function of a function. Its use originates in the calculus of variations where one searches for a function which minimizes a certain functional. A particularly important application in physics is searching for a state of a system which minimizes the energy functional. The traditional usage also applies when one talks about a functional equation meaning an equation between functionals : an equation $F = G$ between functional can be read as an 'equation to solve', with solutions being themselves functions. In such equations there may be several sets of variable unknowns, like when it is said that an additive function f is one satisfying the functional equation

$$f(x+y)=f(x)+f(y)$$

In other words, a functional equation is an equation whose variables are ranging over functions. Functional equations arose from applications in several disciplines like Physics, biology, economics, statistics, information theory, taxation and geometry.

A classical question in the theory of functional equations is the following "When is it true that a function which approximately satisfies a functional equation ϵ must be close to an exact solution ϵ ?" If the problem accepts a solution, we say that the equation ϵ is stable.

In 1940, S.M.Ulam[40] gave a wide ranging talk before the Mathematics Club of the University of Wisconsin in which he discussed a number of important unsolved problems. Among those was the following question concerning the stability of homomorphism:

Let $(G_1, *)$ be a group and (G_2, \circ, d) be a metric group with the metric d . Given $\epsilon > 0$, does there exists a $\delta_\epsilon > 0$ such that if a mapping $h : G_1 \rightarrow G_2$ satisfies the inequality

PROPOSAL FOR MINOR RESEARCH PROJECT

$$d(h(x*y), h(x) \circ h(y)) < \delta_\epsilon \quad \forall x, y \in G_1,$$

then there is a mapping $H: G_1 \rightarrow G_2$ such that for each $x, y \in G_1$ $H(x*y) = H(x) \circ H(y)$ and $d(h(x), H(x)) < \epsilon$?

In the next year, D.H. Hyers [15] gave answer to the above question for additive groups under the assumption that groups are Banach spaces as: Let E_1 be a normed space, E_2 a Banach space and suppose that the mapping $T: E_1 \rightarrow E_2$ satisfies the inequality

$$\|f(x+y) - f(x) - f(y)\| \leq \epsilon \quad x, y \in E_1.$$

Where $\epsilon > 0$ is a constant. Then the limit $T(x) = \lim_{n \rightarrow \infty} 2^{-n} f(2^n x)$ exists for each $x \in E_1$ and T is unique additive mapping satisfying

$$\|f(x) - T(x)\| \leq \epsilon \quad x \in E_1.$$

Also, if for each x the function $t \rightarrow f(tx)$ from \mathbb{R} to E_2 is continuous at a single point of E_1 , then T is continuous everywhere in E_1 .

It is possible to prove a stability result similar to Hyers functions that do not have bounded Cauchy difference. In 1978, T.M. Rassias [34] proved a generalization of Hyer's theorem for additive mapping as a special case in the form of following way: Suppose that E and F are real normed spaces with F a complete normed space, $f: E \rightarrow F$ is a mapping such that for each fixed $x \in E$ the mapping $t \rightarrow f(tx)$ is continuous on \mathbb{R} , and let there exist $\epsilon \geq 0$ and $p \in [0, 1)$ s.t

$$\|f(x+y) - f(x) - f(y)\| \leq \epsilon(\|x\|^p + \|y\|^p) \quad \text{Rassias } x, y \in E.$$

Then there exists a unique linear mapping $T: E \rightarrow F$ s.t $\|f(x) - T(x)\| \leq \epsilon \frac{\|x\|^p}{(1-2^{p-1})}$

$$x \in E$$

In 1982 J.M. Rassias [31] followed the innovative approach of Rassias', theorem in which he replaced the factor $\|x\|^p + \|y\|^p$ by $\|x\|^p \|y\|^q$ with $p+q \neq 1$.

In 1990, Th.M. Rassias [35] during the 27th International Symposium on Functional Equations asked the question whether such a theorem can also be proved for value of p greater or equal to 1. In 1991, Gajda [9] provided an affirmative solution to Th.M. Rassias' question for p strictly greater than one. However, Gajda [9] and Th.M. Rassias and P. Semrl [33] independently showed that a similar result can not be obtained for $p=1$ as follows:

The continuous real-valued mapping defined by

PROPOSAL FOR MINOR RESEARCH PROJECT

$$f(x) = \begin{cases} x \log_2(x+1) & \text{for } x \geq 0, \\ x \log_2 |x-1| & \text{for } x < 0 \end{cases}$$

satisfies the inequality

$$|f(x+y)-f(x)-f(y)| \leq (|x|+|y|) \text{ with } \theta=1$$

for all $x, y \in \mathbb{R}$, and $|f(x)-cx|/|x| \rightarrow \infty$ as $x \rightarrow \infty$ for any real number c .

(iii) Objectives:

- To obtain some new results related to fixed points and stability of functional equations.
- To generalize the various spaces and introduce new functional equations.
- To prove fixed point theorems in various spaces using new iterations and properties like E-property, "E-A property", "E.A.like Property" and also establish couple fixed point theorem.
- To study applications of stability of functional equations and fixed point theory in various field.
- To extend the stability of functional equations using different approaches as fixed point theorems approach, Ulam Hyers approaches and iterations methods.

(iv) Methodology:

The research problems to be discussed will involve fixed point approach, iteration procedure using various mathematical methods. Introducing many new functional equations and prove various results using different approaches. Later on Applications of the work will be discussed and applying in various fields.

(v) Year wise Plan of work and targets to be achieved (Please see Annexure-II)

9. Financial Assistance Required

i.	Books and Journals	:	Rs 50,000
ii.	Equipment, if needed	:	Rs 75,000
	(Laptop:- Rs 50,000; Printer cum scanner cum photo copier :- Rs 25,000);		
iii	Field work and Travel	:	15,000

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iv	Chemical and Glassware	:	Nil
v	Contingency(including special needs)	:	Rs 55,000
vi.	Hiring Services	:	Rs 50,000
Total		:	<u>Rs 2,45,000</u>

10. Whether the teacher has received support for the research project from the UGC under Major, Minor scheme of support for research or from any agency?

No.

11. Details of the project/ scheme completed or ongoing with the P.I.

Not Applicable

12. Any other information which the investigator may like to give in support of this proposal which may be helpful in evaluating.

The Curriculum Vitae of the Principal Investigator is enclosed as **Annexure III**.

It is certified that:

- The college is proved under Section 2(f) and 12(B) of the UGC Act and is fit to receive grants from the UGC.
- General physical facilities, such as furniture/ space etc, are available in the college.
- We shall abide by the rules governing the scheme in case assistance is provided to us from the UGC for the above project.
- We shall complete the project within the stipulated period. If we fail to do so and if the UGC is not satisfied with the progress of the research project, the Commission may terminate the project immediately and ask for the refund of the amount received by us.
- The above research project is not funded by any other agency.

Signature of Principal Investigator
(Dr. Sushma)

Signature of Principal
(Dr. (Mrs.) Suresh Boora)

PROPOSAL FOR MINOR RESEARCH PROJECT

Annexure I

List of Publications (2009-2013):

Dr. Sushma

1. Some results in generalized n -inner product spaces, International Mathematical forum, 4(2009)21-24.
2. On Fuzzy n -normed spaces, The Journal of Fuzzy Mathematics, 18(4)(2010).
3. A Fixed Point approach to Ulam stability problem for cubic and quartic mappings in Non-Archimedean fuzzy normed spaces, Proceedings of World Congress Engineering 2010 vol III, June 30-July 2, 2010, London, U.K.
4. On Reverses of some inequalities in n -inner product spaces, International journal of mathematics and mathematical sciences, 2010, 385824, 22 pages.
5. On generalized n -inner product spaces, Novi Sad Journal of Mathematics, vol. 41, no. 2, 2011, 73-80.
6. Bounded linear operators in transversal functional probabilistic space, Novi Sad Journal of Mathematics, vol. 42, no. 1, 2012.
7. A survey on the stability of some functional equations, International Journal of Mathematical Archive-3(5), 2012, 1811-1832.
8. Stability of functional equations in 2-normed linear spaces, International Journal of Mathematical Archive-3(6), 2012, 1-9.
9. Generalized Fuzzy n -Normed linear space, International Journal of Mathematical Archive-4(4), 2013, 304-310.

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Annexure II

YEAR WISE PLAN OF WORK

Fixed Point Theory and Stability of Functional Equations in Various Spaces.

FIRST YEAR PLAN:- Fixed Point Theory and Stability of Functional Equations in Various spaces.

In the first year, we will take up the research problems on Fixed point theory and stability of functional equations. The credit of making the concept of fixed point theory useful and popular goes to polish mathematician Stefan Banach. In 1922, Banach [3] proved a common fixed point theorem, which ensures the existence and uniqueness of a fixed point under appropriate conditions. This result of Banach is known as Banach fixed point theorem or Banach Contraction Principle. The following is known as Schauder fixed point theorem (Second form).

“Let X be a Banach space, C a closed, bounded and convex subset of X and $T: C \rightarrow C$ a compact map. Then T has atleast one fixed point in C ”.

This theorem is of great importance in numerical treatment of equations in analysis. In 1935, Tychonoff [39] extended Brouwer's result to compact convex subset of locally convex topological vector space as: Let C be a non empty compact convex subset of a locally convex topological vector space X and $f: C \rightarrow C$ a continuous map. Then f has a fixed point. In 1976, Jungck [18] gave a generalization of Banach's Contraction Principle by using the concept of commuting mappings. “Let T be a continuous mapping of a complete metric space (X, d) into itself. Then T has a fixed point in X if and only if there exists a mapping A of X into the range $T(X)$ of T , which commutes with T and satisfies the inequality

$$d(Ax, Ay) \leq \alpha d(Tx, Ty)$$

For all $x, y \in X$, where $0 \leq \alpha < 1$. Indeed, T and A have a unique common fixed point in X ”.

In 1982, Sessa [38] generalized theorem for two self mappings f and g of X satisfying a weaker hypothesis than commutativity, known as weak commutativity. Afterwards, in 1986, Jungck [20] proposed a more generalized concept of weakly commuting mapping, and called it compatible mappings and proved some common fixed point theorems for these mappings. For detail, see reference, Assad and Sessa [1], Chang [5], Jungck [16-20], Kasahara [24], Kang [23], Kang and Rhoades [24]. In 1994, Pant [28] introduced the notion of pointwise R -weak commutativity and proved a theorem in which the fixed point may be a point of discontinuity.

In 1998, Jungck and Rhoades [19] introduced the notion of weakly compatible maps for set valued mappings. Its application to the control theory became successful and revolutionary especially in seventies and eighties. The applications to data analysis, artificial intelligence and computational intelligence are intensively developed since nineties. The theory is also extended and generalized by means of theory of triangular norms and co- norms. Grabiec [13] followed Kramosil and Michalek [25] and obtained the fuzzy version of Banach contraction principle. The

PROPOSAL FOR MINOR RESEARCH PROJECT

result proved in metric spaces by various authors were further extended by many authors in the setting of fuzzy metric spaces

Fuzzy sets

The concept of Fuzzy set was published in 1965 by Lotfi A. Zadeh [45], Prof. of Computer Science in Univ. of California. Its application to the control theory became successful and revolutionary especially in seventies and eighties. The applications to data analysis, artificial intelligence and computational intelligence are intensively developed since nineties. The theory is also extended and generalized by means of theory of triangular norms and co-norms. The concept of fuzzy sets is basically a theory of graded concept – a theory in which everything is a matter of degree or everything has elasticity.

As a generalization of fuzzy sets introduced by Zadeh [45], Atanassov [2] introduced and studied the concept of intuitionistic fuzzy sets. In the last ten years IFS were applied in different areas. There are applications of IFSs in medical diagnosis and in decision making in medicine, developed by Anthony Shannon, Soon Ki- Kim, Eulalia Szmidt, Janusz Kacprzyk, Humebrto Bustince, Joseph Sorsich and others. Plamen Angelov has solved some optimization problems by means of intuitionistic fuzzy sets and also has worked on optimization in an intuitionistic fuzzy environment. There are many applications of IFS in chemistry. Park [29] using the idea of intuitionistic fuzzy sets, defined the notion of intuitionistic fuzzy metric spaces with the help of continuous t-norm and continuous t-conorm as a generalization of fuzzy metric space due to George and Veeramani [11]. Actually, Park's notion is useful in modeling some phenomena where it is necessary to study the relationship between two probability functions.

The problem related to stability of functional equation is imposed by, S.M.Ulam[40] in 1940. After that this problem is highlight. Recently, in 2007, M.S.Moslehian and Rassias[30] proved stability of Cauchy functional equation $f(x+y)=f(x)+f(y)$ and quadratic functional equation $f(x+y)+f(x-y)=2f(x)+2f(y)$ in non-Archidean normed spaces. V.Faiziev and P.K.Sahoo[42] proved the stability of Jensen's equation on non-commutative groups. In 2011, H.Kenary, C.Park, H.Rezaei and S.Y.Jang[25], using fixed point method proved Stability of different quadratic functional equation. After that, E. Movahedhia, S.Eshtehar and Y.Son[7] proved Stability of quadratic functional equation $f(x+y+z)+f(x-y)+f(y-z)+f(z-x)=3f(x)+3f(y)+3f(z)$ in Fuzzy normed space. Raza Saadati, Y.J.Cho and J.Vahieti established the Stability of quartic functional equation in non Archimedean random normed spaces. J.Hyeong and W.Gill Park[14] introduced dquadratic functional equation of 2-dimansional vector as $f(x+y,z+w)+f(x-y,z-w)=2f(x,z)+2f(y,z)$ and proved its stability in Intuitionistic fuzzy normed space. Recently, J.Lee, D.Shin and C.Park[27] proved the stability of Cauchy additive functional equation and quadratic functional equation in matrix normed spaces. Now a days G.Zamani and P.Gavruta [10] investigated the stability of Pexiderized Cauchy functional equation in 2-Banach spaces. Dorel Mil applied Luxemburg Jung fixed point theorem in generalized metric spaces to study the Hyers- Ulam stability of functional equation.

PROPOSAL FOR MINOR RESEARCH PROJECT

Objective.

- To obtain some new results related to fixed points and stability of functional equations.
- To generalize the various spaces and introduce new functional equations.
- To study applications of stability of functional equations and fixed point theory in various fields.

SECOND YEAR PLAN:- Properties of Fixed point theory and stability of functional equation in various spaces.

In the second year, we will take up the research problems on **Properties of Fixed point theory and stability of functional equation**. Description of the topic to be considered in the second year is given as under:

Using notion of fuzzy sets, Kramosil and Michalek [26] introduced the concept of fuzzy metric spaces. Many authors have studied fixed point theory in fuzzy metric spaces. George and Veeramani [11] modified the concept of fuzzy metric space which was introduced by Kramosil and Michalek [26]. They, also, obtained the Hausdorff topology for this kind of fuzzy metric spaces and showed that every metric induces a fuzzy metric.

Park [29] using the idea of intuitionistic fuzzy sets, defined the notion of intuitionistic fuzzy metric spaces with the help of continuous t -norm and continuous t -conorm as a generalization of fuzzy metric space due to George and Veeramani [11].

The concept of linear 2-normed spaces and n -normed linear space has been investigated by S. Gähler [8] in 1964 and has been developed extensively in different subjects by many authors. The concept of n -inner-product space was developed by Misiak in 1989. K. Tranevski and R. Malceski gave the definition of generalized n -inner product space which generalizes the definition of Misiak of n -inner product.

In [31] A. Narayanan and S. Vijayabalaji introduced the notion of fuzzy n -normed linear space. [44] Vijayabalaji, Thillaigovindan and Jun introduced the notion of intuitionistic fuzzy n -normed linear space as generalization of fuzzy n -normed linear spaces. Probabilistic normed space (briefly, PN-space) was first defined by Serstnev in the early sixties. Ioan Golet [12] studied generalized probabilistic 2-normed spaces and topological properties of these spaces.

Objective:

- To prove fixed point theorems in various spaces using new iterations and properties like E -property, " E -A property", " E -A-like Property" and also establish coupled fixed point theorem.

PROPOSAL FOR MINOR RESEARCH PROJECT

- To study applications of stability of functional equations and fixed point theory in various field.
- To extend the stability of functional equations using different approaches as fixed point theorems approach, Ulam Hyers approaches and iterations methods.
- To generalized above mentioned spaces and discuss the applications.

References

1. Assad, N. A, and Sessa, S., Common fixed points nonselfmaps on compacta, *SEA Bull. Math.*, 16(1992), 1-5.
2. Atanassov, K., Intuitionistic fuzzy sets, *Fuzzy sets and systems*, 20(1986), 87-96.
3. Banach S., 'Sur les opérations dans les ensembles abstraites et leurs applications', *Fund. Math.*, 3(1922), 133-181.
4. Brouwer, L.E.S., Über Abbildungen Von Mannigfaltigkeiten, *Math. Ann.*, 77 (1912), 97-115.
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Annexure III

CURRICULUM VITAE: Dr. Sushma

1. Name	:	Dr. Sushma
2. Husband's Name	:	Mr. Anil Kumar
3. Date of Birth	:	15.02.1984
4. Designation	:	Assistant Professor Department of Mathematics, Kanya Mahavidyalaya, Kharkhoda. Distt. Sonapat (Haryana)
5. Date of joining the college	:	01.07.2010
6. Address and Contact No.	:	H.No. 769/21, Prem Nagar, Rohtak Mob: 9466476402
7. Academic Qualifications	:	M.Sc. (Mathematics) Ph.D. (Mathematics) JRF-NET (Mathematics) Qualified
8. Teaching Experience	:	2 years of Postgraduate Classes $3\frac{1}{2}$ years of undergraduate classes
9. Research Experience	:	$5\frac{1}{2}$ years
10. Fellowship Awarded	:	Junior Research Fellowship awarded by CSIR.
11. Research Interests	:	Fixed point Theory, Fuzzy Mathematics, Normed and Inner product spaces.

12. Publications:

(i) Research Papers published

Papers Published : 09 (Please see Annexure I)

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(ii) Abstracts published in Conferences - 1

Academic/Administrative Experience

1. Awarded CSIR Junior Research Scholarship.
2. Orientation/Refresher Courses/Summer institution/Seminars/Conferences/Workshops and presented Paper.

Name of the Course	Duration	Name of the Institution where attended
Refresher Course	22.12.2010-12.1.2011	B.P.S. Mahila Vishwavidyalaya, Khanpur, Sonapat
Orientation Course	03.5.2012-31.5.2012	B.P.S. Mahila Vishwavidyalaya, Khanpur, Sonapat

3. Attended International Conference Operator Theory and Related Areas, Department of Mathematics, University of Delhi, Delhi during January 9-12, 2008.
4. Attended and presented a Paper entitled "On Intuitionistic fuzzy n -Norm" in International Conference on Recent Trends in Mathematics and its Applications (ICRTMA-09) on March 30-31, 2009 held at Jamia Millia Islamia
5. Attended and presented a paper entitled "On n -Fuzzy Normed and n -Fuzzy inner product spaces" In National Seminar on **application of Mathematics in Engineering Science**. NC College of Engineering, Israna (Panipat), March 17, 2012.
6. Attended and presented a paper entitled "Stability of functional equations in 2-normed linear spaces" In National Seminar on Mathematics and its Applications, Vaish College, Rohtak. March 27-28, 2012.
7. Attended and presented a paper entitled "Some properties in n -Normed Space" In national Seminar on Recent Developments in Mathematics and its Applications, Government Post Graduate College Sector-9, Gurgaon 03 February, 2012.
8. Attended and presented a paper entitled "On n -Normed linear and n -inner product spaces" International Conference on History and development of Mathematical Sciences & Symposium on Nonlinear Analysis (ICHSDMS-2012). Department of mathematics, Maharshi Dyanand University, Rohtak (Haryana), November 21-24, 2012.