Information Technology (IT)

□ *Alok Das*
Lecturer, Dept of Mathematics

The expression 'Global Village' is no longer a contradiction in terms. It is well adopted through the emerging information technology. Starting from the Industrial Revolution, the development in electricity, telecommunication, aviation and private automabiles filled up the mass economy which are responsible to contribute significantly to improvement in standard of living the world-wide. The revolution under the area of information influences more a market economy. For example , cybespace could become a global market place where consumers and producers are so closely integrated that they can change places with each other. The print media and paper are on the way out after arrival of silicon and other semiconductors which have made access to information within a very short period of time. The television and the computer have come to the centre stage in the educational world of the new millennium.

Before the invention of printing the prevalent method was 'Oral' and the print media gave a big boost to publishing about five centuries since Gutenberg. New information technology shifts its paradigm (concept accepted by a group of people) from memorizing and silent reading to the scanning of the date to synthesize it to generate knowledge which are useful for solving problems.

It is supposed that the offices of future are also the libraries of this new millennium will be ' paperless'. Personal computers, Educational Television, Multi-media and Networking of information agencies have made rapid encounters. It is a fact that India would be a part of the 'Information super Highway'. As version stated by Bill Gates, ' the American silicon valley is run by the technicians of Indian origin.

The invention of paper and the printing press are definite landmarks in the history of civilization. The art of reading books is not merely a congnitive process of awareness of data by decoding the linguistic symbols but a creative one to integrate information into knowledge . A CD ROM can hold as much as 300,000 to 600,000 A 4 pages of a text or 75 books of 300 pages each. That disk is compact to be slipped into a pocket where as the materials in the book form is needed more space.

The new IT through the world of computer becomes sophisticated day after tomorrow and the expenses are less. The satellite technology has increased opportunities for a global scale. Teleconferencing and telephoning system is sought to be made available to even remote, rural and tribal areas. Thus the social impact of these recent trends in information system is being observed in the areas of Education, Science, Health and Community Development . It helps to bring out the

disadvantaged segment of socity into the mainstream of national life.

Through the line of IT , the homes of future will become to harbour the 'Virtual Office' or 'Virtual Work Spot'. Thus the pressure on the roads and the perils of transportation are likely to be reduced to the minimum. One can deliver lecture from the home from electronic communication adopted from the distance education.

The satellite technology may supplement learning in a big way. The access to information system through INTERNET and INFLIBNET (Information and Library Network) will play a great role in the research purpose. The teachers in the new mellennium are the user of this technology in the class rooms.

The transport of information from one point to another is fixed in mobile. It is made possible easy with the combination of several media. For example , Digital Multi-media have made TV interactive .. Hence from mere entertaiment, it has elevated its functionality to information supply and education. multi- media computer can be used for training on education in a one - to - one situation with the student. As physical conversation are expensive involving travel and dislocation, Multi- media facilities, teleconferencing as a result one can attend the meeting without leaving the work place.

Whatever the technology traditional or modern, age old or sophesticated, it is based on basically human power and skill or machine power, it implies application of human knowledge with machine and tools to solve the problems in a practical manner. However, in a country like India with vast segment living in rural and tribal areas the traditional print media and the modern IT may coexist for a few decades. Nobal Laureate Prof. Amartya Sen has stated the only technology can give a pointed direction to development. But in reality the thinking in the scientific and technological society which is possible only by the human mind and not by the machine.□□□

References cited :-
1. Mahendra Bora, Information Techrology, 1999.
2. Resonance, Journal of Science Education, vol.5, No 3, 2000.
3. Resonance, Journal of Science Education, vol. 5, No. 6, 2000.
4. R. Natarajan, University News, A weekly Journal of Higher Education, vol. 37, No. 40, 1522, 1999.
5. S. Abdul Kareem, University News, A weekly Journal of Higher Education, vol.37, No.37, 16-19, 2000.

Criticism is a disinterested endeavour to learn and propagate the best that is known and thought in the world.

- Mathew Arnold

Quark: The Ultimate Particle

□Ranjit Baishya
Lecturer, Dept of Physics

Till today the most prestigious question to particle physicists is that'with which the world is made of?'previously it was belived that matters were formed by four basic things namely AIR,WATER, FIRE and EARTH. In this idea atoms were the smallest part of the element. Prof. J.J.Thomson assumed that atom was a sphere where equal amount of positive and negative charges were distibuted. But in 1906, Prof. Rutherford rejected Thomson's atomic model.Because the model could not explain satisfactorily the X-ray scattering experiment perfomed by Rutherford. Rutherford assumed that there was a strong core called nucleus inside the atom which was pasitively charged. Around the nucleus electrons rotate in different circular arbits. Next, Bohr gave his own atomic model to explain the hydrogen spectrum. Later on, Sommerfield introduced the idea of elliptical orbits. In 1932, Chedwick discovered a new particle called Neutron. The mass of neutron is almost same as that of proton. Thus the main constituents atomic nuclei are protons and neutrons. So it was obviously assumed that proton, neuton and electon togother were sufficient to account for the structure of matter.

As more and more refined techniques of studying matter become available , the elementory particle scenario become more and more complex . Later on a lot of elementaory particles are discovered. On the basis of some parameters like mass, spin , isospin, strangeness, parity etc. Elementary particles are classified (Table -1).

[A] Fermions : It has been found that half odd integral spin particles are governed by Pauli's exclussion principle and obey Fermi-Dirac statstics. Fermions are classified as

(1) Leptons : The Fermions of spin 1/2 which have a mass less than that of nucleons (proton, neutron). Leptons are Muons (μ^+, μ^-), electron (e^-), positron (e^+), neutrinomuon (γ_μ), antineutrino muon (γ^-_μ), neutrino electron (γ_e)and antineutrino electron (μ^-_e).

(2) Baryons : The permions of half- intergral spin and have masses equal to or in excess of nucleon mass. They are subjeted to strong, weak
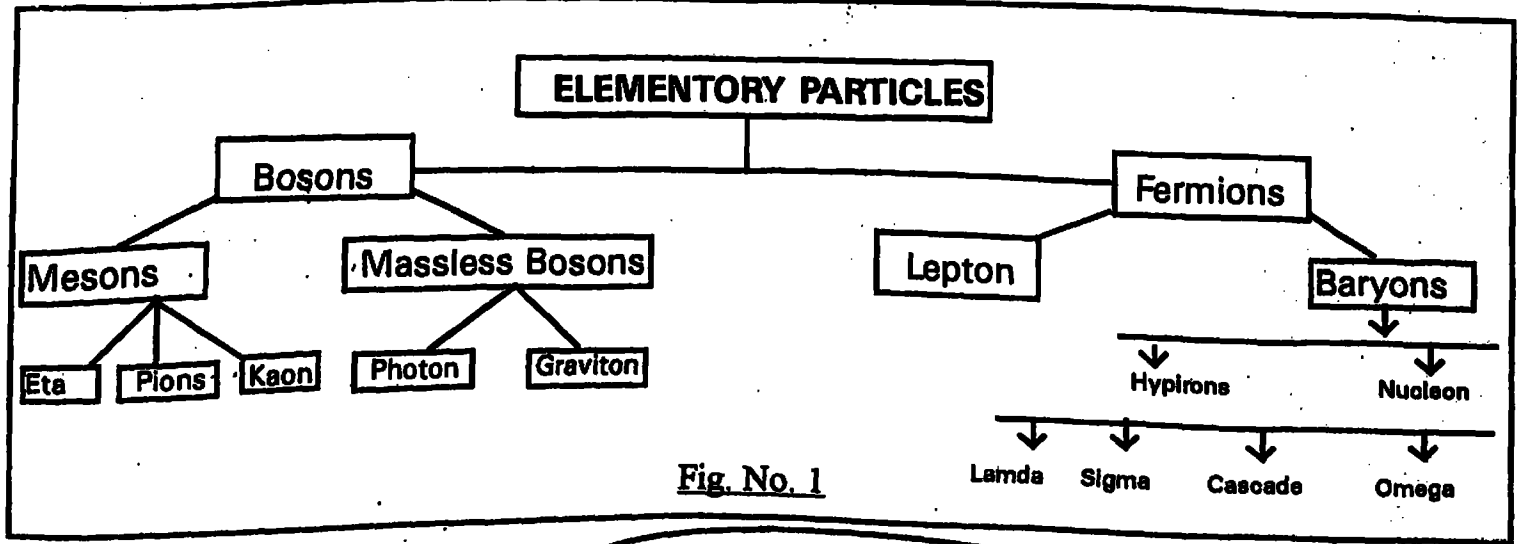

Fig. No. 1

and electromagnetic interaction . Baryons are proton (p), neutron (n) , omega hyperon (Ω^-), cascade hyperon (Ξ^0, Ξ^-) , sigma hyperon (Σ^+, Σ^0, Σ^-) Lambda hyperon, (λ^0).

(B) Bosons: The integral spin particle obeying. Bose- Einstain statistic are called Bosons.

(1) Massless Bosons: This group consists of integral spin basons and the rest mass equal to zero . Photons and gravitons are massless Basons.

(2) Mesons: This group consists of spin zero (o) and having mass between the leptons and nucleon. Mesons are pions (π^+, π^-, π^0) kaons (K^+, K^-, K^0, K_0^-) and Eta (η^0).

It has not been possible to develop a general symmetry scheme which could cover all the known particles and also those to be discovered in future. Of course there have been many attempts to discover symmetries among the elementary particles which govern these existance and interactions. Such attempts started in 1949 when Fermi and tried to consider the pions as composed of a N-N pair. However, the most important contribution in this derection have come from M. Gelt Mann and independently by Neeman in 1961 brought a symmetric scheme known as the Eight fold way " in which all the known particles and resonance are grouped together by the application of spe

cial unitary symmetry group known as SU (3). It is called the Eight fold way" because it covers relations between eight conserved quantities.

The mumber of fundamental particles making up the atom appeared to grow without limit till order was established in 1970 with the coming of what is now known as the " Standard Model".of particles and forces. In this model all the particles were grouped into just two families - Quarks and Leptons, with another group called Guage bosons which gave rise to the forces in nature.

Theoritically predicted that there would be six Quarks and six Leptons as well as their antiparticles. These are grouped into three generations. The first generation makes up all ordinary matters and other two generations are produced either in particle collision or in cosmic interaction .For example protons and neutrons were considered to be a mixture of up (u) and down (d) quarks,

P = Uud

n= Udd

Though quarks carry fractional charge

STANDARD MODEL			
First Generation	Second Generation	Third Generation	Charge
QUARKS			
Up (u) Down(d)	Charm (c) Strange (s)	Top (t) Bottom (b)	+ 2/3 -1/3
LEPTONS			
Electron (e)	Muon ($\mu-$)	Tau (τ^-)	-1
Elecron neutrino(γ_e)	Muon neutrion (γ_m)	Tu neutrion (γ_n)	0
Make up ordinary matter	Produced only in high energy particle accelerator or cosmic interaction.		

(+ 2/3 Or - 1/3), but a combination of them that make up the proton and neutron etc. Results in a net charge of one or zero, and so we do not find atoms with fractional charge.

The quark cannot exist in free state and so their presence can be inferred only indirectly from trails of reaction products they leave in detectors. Till sometime ago all the quarks except the top quarks had been detected by Scientists. The discovery of the top quark at Fermilab National Acclerator Laboratory, Chicago USA, now completes the tally.

As far as mass is concerned, the quarks differ widely. The lightest quark is the up (u) quark which have a mass of only a few millions electron volt (Mev).* Next is down (d) quark with a mass of more than 100 Mev. followed by charm (c) with about 1.5 Gev. and bottom (b) quark with a mass of about 5Gev. The top (t) quark was predicted to be several times more massive. After discovery it appears to be as high as 1999Gev. And that was the reason why it took so long to detect it .No one as yet knows why top quark is so heavier. Physicists also do not know why quarks should have a fractional charge. Instead of that while the discovery of top quark has justified the standing gap in our understanding of the nature of the material world.

*Since mass and energy are equivalent ($E = mc^2$) particle physicists usually describe mass of a particle in terms of equivalent energy. expressed as election volt (ev) .Election volt is defined as the amount of energy acquired by an electron when it is accelerated through a potential difference of 1 volt, i.e,

$$1 \ eV = 1 \ volt \times e^-$$
$$= 1 \ volt \times 1.6 \times 10^{-19} \ Coulomb$$
$$= 1.6 \times 10^{-19} \ joule .$$
$$1 \ MeV = 10^6 \ eV.$$
$$1 \ GeV = 10^9 \ eV .$$

References:-
(1) Science Reporter.
(2) Nuclear Physics by Tayal.
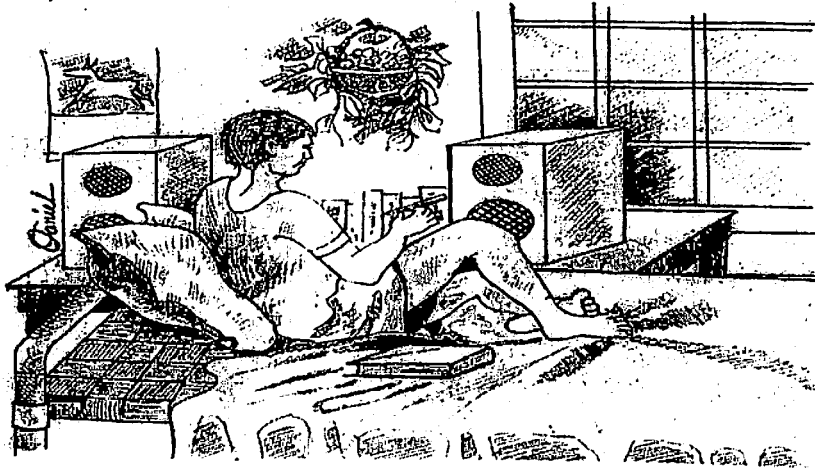(3) Nuclear Physics by Kaplan .

□□□

" A Good Education is that which gives to the body and to the soul all the beauty and all the perfection of which they are capable."

- Plato.

SEARCHING FOR A PLOT

□ *Kaushik Dutta*
H.S. 2nd year

It has been almost three months since Nihar came to Delhi. He is doing his B.B.A (Bachelor of Business Administration) from a top institute at Delhi. Since it is Sunday today he is alone in the hostel . All the new friends of him in the hostel have gone for the evening cinema . Nihar has to write a story for the college magazine which he has to submit the next day o the editor . So he stays back .

Nihar closes the door of his room and plays a cassette of Jagjit Singh in his music system. He lies down on his bed and tries to think over a plot for his story. But nothing comes to his mind . Nihar closes his eyes and unknowingly he slips into the deep ditch of oblivion.

It is drizzling outside. Nihar loves this type of wet weather very much. Perhaps many of the memorable incidents of his life are someway or the other related to such wet days. How can Nihar forget the day of his H.S.L.C. result. It was perhaps the first tough time in his life that he had to pass by . He studied in the nearby Don Bosco School . He was a mediocre boy and everybody was expecting the first division from Nihar.It was lunch time on the result day and he was taking his lunch.Some of his friends Prahlad, Rajib,Gautam and Palash came with the results. Nihar still vividly remembers how he ran to the gate without finishing his lunch . From a distance Gautam said , 'Nihar you get the second division. Palash and Ajoy get the first division.'

This was a shock to Nihar. Tears rolled down from his eyes unknowingly like the summer rain. Nihar could still remember how he cried in his mother's arms . His mother, father and his elder brother found no words to console Nihar .After getting the marks he got in English 45 marks which was unbelievable for him. After re-examination it was found that he got the first division with letter marks in English .

It is raining quite heavily outside . Till now Nihar cannot find out a plot for his story. Only a few hours are left . He has to submit the story the next morning . Nihar does not understand why he is remembering all these past memories today. It seems that the Ghazals of Jagjit Singh which is playing in the music system acted as a catalyst to his nostalgia. Nihar tries to think a plot but is in

vain . He again becomes nostaligic . The H.S.L.C. result was perhaps the turning point of Nihar's life . All of his friends went outside to study. But Nihar was all alone in his home town. After lots of thinking and discussions with his parents he took admission in the local college where his Daddy was a lecturer. Nihar was totaly down because there was a big gap between his ambition and the reality . He was like an aimless person. His Daddy was always at his back and gave him a lot of moral support, and courages by saying, 'Nihar you don't lose confidence in yourself. Have faith in yourself .There is no reason why you can't succeed . You can do a good result here and go outside for higher studies.' Even his Mummy and elder brother told him the same thing .

In college Nihar knew nobody . He thought how he would spend these two years there. Since his father was a lecturer of the college, Nihar know many of his colleagues and he got a lot of loves and helps in his studies. Nihar was totaly lonely and aloof. As time passed he made a few friends and began to love the college life. Mayur and Juri were his intimate friends ; and Manas that the handsome looking boy! As Nihar remember Manas, his heart pained. He could feel his eyes becoming wet. He doesn't understand why this happens to him whenever he remembers Manas.

Suddenly somebody knocks at the door . There is a break in his memories: He thinks who came at this time . He very reluctantly goes and opens the door. His classmate Bikram is waiting outside the door. Bikram asks Nihar about some notes.

: Nihar , do you have the notes that sir gave yesterday :

: ' Yes', replied Nihar .

: Please give me . I 'll return you tonight .

Nihar goes back to his room , takes the notes from the table and gives it to Bikram. Bikram wishes him thank you, and goes away. Nihar was very reluctant to speak to Bikram. He closes the door and again comes back to his bed.

The frindship between Nihar and Manas was a much talked topic of the whole class. Their intimacy was such that they shared even the deepest truth of their life, except that one truth that they kept secret to themselves Manas had weakness towords the cute beautiful looking girl Aditi of their class . Maybe he loved Aditi The whole class knew about it except Nihar Nihar himself to a certain extent had weakness towards Aditi. But nobody knew about it . Nihar thought to speak to Aditi many days but lack of courage resisted him from doing so . Nihar even today doesn't understand why he did not share that truth with Manas. Perhaps they became selfish and introvert.

As time passed there was a gap in their friendship . Manas began to avoid Nihar and stopped talking with him . Nihar at first didn't understand the reason why Manas had that sudden change . But after some days Nihar came to know from Mayur and Juri that Manas loved Aditi and she too loved him. Nihar understood why Manas had changed so much. But Nihar did not understand why Manas had this change. They were intimate friends. They shared even the deepest truth of their life . Then why they did not share this truth? Perhaps Manas thought him as a thron in his side . But Nihar had no answer to this question. The truth about Manas and Aditi was a shock to Nihar . Nihar was with his back to the wall after the divulge of this truth He was mentally in despair. That day also was a wet day.

Slowly Nihar came away from Manas and Aditi's life. The whole class questioned Nihar and Manas . They could only give half baked answers. Nihar could not even understand his emotions. It took some days to pull himself together. He tried to maintain his emotions despite the tough truth he had to face. He did not understand why he was sad, because of loss of freindship with Manas or something else?

Months passed in no time . Nihar concentrated in his studies . He took pains in his

studies. The first year result was not up to the expectation. But in the second year he studied hard from the beginning . He made up his mind that he will go outside for his higher studies . He wanted to leave behind all his bitter memories.

Nihar got a lot of helps and supports from his brother in the studies. His father was also a big support to both of them. He wanted his elder son to be a lecturer. But this was a wish of his father which was never fulfilled .His elder brother was not at all interested in the teaching profession . Nihar still remember the faded face of his father when his brother gave the news of getting admission at IIM, Ahmedabad to prosecute the study of M.B.A. Nihar became very lonely . He too made-up his mind to make business management as his career. With this sole aim in his mind he concentrated on his studies.

It is raining cats and dogs outside. He sees some school children passing by the window. Perhaps school is over now . They are totaly wet. In his school days Nihar too loved to go out in the rain. His parents scolded him many times for this reason.Whenever he remembers his early days he imagines of a carefree life; a life without any desperate or difficult situation, rather only love and full of happiness .

Nihar remembers that he is given a task to write a story for the college magazine. Tomorrow he has to submit it to the editor . But till now he has not written a single word. Actually he did not have a plot in his mind. He looks at the watch . It is 10 past 3 o' clock . This watch was presented to him by his Daddy last year on his birthday. But this costly gift also could not bring happiness to Nihar that day, because the day before his birthday the most tragic incident took place in his life.

Nihar could still vividly remember the day . It was 2nd September, Wednessday. Nihar as usual had gone to college. At the entrence gate, Amit one of his friends gave him the news of the death of Manas which came as bolt from the blue .

Manas was suffering from jaundice. Last night he had a high fever, and he passed away Amit said many more things but Nihar did not hear anything. He was stunned . Nihar looked at Amit like a dumb person . He felt that the world was collapsing around him and everything seemed to be invisible to him. Nihar came back home .While he was coming , he saw a girl weeping in her friend's arms. That girl was none other than Aditi. Nihar totaly broke down. The whole day he cried trying to kill the pain . That day was also a rainy day . The weather was wet.

Even though the death of Manas was incidental yet, Nihar thought himself someway or the other responsible for his death. The thought of Aditi made him even more tensed.Nehir thought he himself could not take the death of Manas easily , how could Aditi take? It took long for Nihar to come out of this situation. He tried to concentrate on his studuies. He dreamt a new dream

Nihar came out with flying colours in the final examination. His Daddy wanted him to study English as his major subject . But Nihar made-up his mind to study Business Mamagement . The decision of Nihar to study Business Management no doubt had some impact on his Daddy but the irresistable love for Nihar made him perceive the decision from Nihar's point of view.Nihar new that his Daddy could not fulfill one of his wish that to make any of his son lecturer.

Nihar got admission in one of the top Management institutes at Delhi . Mayur and Juri came to meet him before the day he left for Delhi. They came to bid farewell to him. They knew what was going on inside Nihar, because they were the only two persons who knew the deepest secret hidden inside Nihar . They told him many things about Aditi. They told him to go, and told Aditi about his feelings. But Nihar could not take any

decision. He could not understand how he would face Aditi. Nihar asked for some time to think. Mayur and Juri gave him a lot of support .

Suddenly someone knocks at the door. Nihar opens the door . It is Bikram with a letter in his hand.

'Nihar , I got this letter inside your note book', said Bikram . Bikram goes away .

Nihar takes the letter and remembers that he got this letter yesterday and kept it inside his note book. His mind was so much crowded with thoughts of a plot that he even forgot about the letter . Nihar sees the letter. It is addressed to him in beautiful handwriting . May be from one of his friends. Nihar closes the door and lies down on his bed. He opens the letter and sees the name of the writer . He cannot believe his eyes . He again reads it . But it is true . It is from none other than Aditi . Nihar reads the letter and closes his eyes.

The lonely feeling that Nihar had till now was slowly fading away. Nihar feels that his dreams that once he dreamt which was in the verge of ex-tinction might survive now. He feels that the misery and disappointment in his life now would be over with a modicum of love from a loved one. He remembers the lovely song of Lobo, 'I would love you to want me .'

The rain ceases by now . There is a feeling of wetness everywhere. Nihar loves this type of weather very much. Nihar takes a very big decision on his life for the first time .He thinks of saying every feeling of his heart to Aditi.He has a lot of things to say her because Aditi is his first love.

Suddenly there comes a plot in Nihar's mind! He feels that a wonderful story may be developed from the incident of his life.His life is no less than a story. Though Manas is no more, yet the ending of the story would be a happy one where the main character would express his love for his beloved which is kept secret in his heart for so long .

It is allready dusk . The birds are returning to their nests after a long days toil. Nihar sits down to write the story .

- 0 -

'You open doors when you open books. Doors that swing wide to unlimited horizons of knowledge. Wisdom and inspiration that will enlarge the dimensions of your life .'

- Swami Vivekananda.

MATHEMATICS WITH UNCERTAINTY

☐ Dipankar Sarma,
Lecturer Dept. of Mathematics.

Wedding. Your brother selects three girls with good family background, good educational qualifications, good charecter etc. You are to select the most beautiful from the three nominated as bride of your brother. You face them and you think which one of them is the most beautiful. One of them is very beautiful with jovial face but the hair is not so long as you wish. So she will not be the best for you. Next one, with acceptable length and style of hair is very beautiful, but she is not so slim as you seek. So you can not select her. In this way in each case you may face difficulties in selection and may try to solve the problem with giving preferences asking your brother.

Next a question for you. What is the total number of tall teachers of J.N. college now ? Ten, Twelve, Fifteen , ... We will get different answers from different persons. If some one says it is twelve, for other it may be Eight. Certainly we cannot get a definite answer. But it is not familiar in Mathematics. So whether it is a mathematical problem or not ?

I think all of us have a good idea about a set. Now in high school level also Set theory is included in the general course of Mathematics. In day to day life we are familiar also with some set related words like Tea set, Main set of dress for a bride, etc. Set is a collection which is well defined. The law of inclusion of elements to a set should be clear. We can easily say whether a particular element is in one set or not. For example consider the set of the seven days of a week . Then we can say that Tuesday is in this set , but July is not in this. Similarly in the set of all universities of Assam , Gauhati University is a member , but Calcutta University is not a member . It is clear. Nobody can say differently here.

Now we consider one example. Suppose H denotes the set of all Hindi feature films of India that released up to this time. If we try to construct the set P of all old films from H, then first we include the names like ' Mahal', ' Anarkali', 'Mother India' etc from the first film (Talky) 'Alam Ara', (1931) . In this process when we consider the film " sholey" , we have some confusion . Comparing with 'Anarkali', 'sholey' is not old film , but if we compare 'sholey', with " Koho Na pyar Hain" then 'sholey' is an old and it should be included in P. So here we connot get a definite structure of P.

Next consider another example .If S denotes the set of all small natural numbers , then clearly 1,2,3,4,5 etc belong to the set S. But in case of 20. We can not confirm. Comparing with 1,00,000, 20, is very small. So it should be included in S. But with respect to 1, 20 is not to be included in S . Therefore we have different views from different sides. In this case also we can not get a definite structure of the set . Why so happens ?

All of the above confusions come because the definitions of such collections are not well defined. In the first case the year or time is not said that we can say a film as an old film which is released before that specific year . Similary in the second case we are not told upto which number we can take as small.

The sets with this type of uncertain fashions are called Fuzzy sets . We notice that all of these sets must have an ordinary superset from which we can construct the new subset . So always Fuzzy

sets are actually subsets of some set .

It is first enunciated by L. A. Zadeh in 1965. The railway stations near Guwahati, attractive flowers in garden, tall students of a class etc are examples of Fuzzy subsets, because all of them are not defined well.

Now we come to a mathematical representation of sets and their subsets. Suppose $X = \{ x_1 , x_2, x_3, \}$. Let A be an ordinary subset of X. Then we can associate a function μ with the element of X such that

$$x \in A \quad \text{if} \quad \mu_A(x) = 1$$
$$x \notin A \quad \text{if} \quad \mu_A(x) = 0$$

and if $A = \{ x_1, x_3 \}$, then we can express the subset A with the ordered pairs as $A = \{ (x_1, 1), (x_2, 0), (x_3, 1) \}$ where the first of each pair is a member of x and the second is the charecteristic functional value of that member with respect to the subset A , which is called gread membership functional (g.m.f.) values of the respective elements. For the ordinary sets g.m.f always takes the values 0 or 1..

Now consider the set E of all positive integral even numbers. Thus

$$E = \{ 2,4,6,8,10,12,14,16,18,\dots\dots\dots\dots \}$$

Then construct the set of small positive integral even numbers, say S. First 2 is the smallest. So the g.m.f. value for 2 is must be 1. Then for 4 say g.m.f. value is ·8, i.e. $\mu_s(4) = ·8$. Then suppose $\mu_s(6) = ·6, \mu_s(8) = ·4$, $\mu_s(10) = ·2$, $\mu_s(12) = 0$, etc.

Then we can write S as

$$S = \{ (2,1),(4,·8), (6,·6), (8,·4), (10,·2), (12,0), (14,0), (16,0), \dots\dots \}$$

Taking different values of the g.m.f. of elements we can get a large or small size of the fuzzy subset as we wish .Thus for different persons one set has different sizes.

If A is a fuzzy subset , it is denoted as $\underset{\sim}{A}$. As in the general (ordinary) set theory, we can apply the main set operations in Fuzzy subsets also . We now observe some of these operations.

(1) Inclusion :
Let $\underset{\sim}{A}$ and $\underset{\sim}{B}$ be two fuzzy subset of X
Then $\underset{\sim}{A} \subset \underset{\sim}{B}$ if $\forall x , \mu_A(x) \leqslant \mu_B(x)$.

Example :
Let $\underset{\sim}{A} = \{(x_1, ·2), (x_2, ·1), (x_3, 0), (x_4, ·7) \}$
$\underset{\sim}{B} = \{(x_1, ·6), (x_2, ·1), (x_3, ·2), (x_4, ·7) \}$
Then $\mu_A(x) \leqslant \mu_B(x)$, $\forall x$ and so $\underset{\sim}{A} \subset \underset{\sim}{B}$
Note : if $\mu_A(x) = \mu_B(x)$, $\forall x \in X$ then $\underset{\sim}{A} = \underset{\sim}{B}$.

(2) Complement :
Suppose $\underset{\sim}{A} \subset X$. then $\underset{\sim}{B} \subset X$ is said to be the complement A if

$$\forall x \in X, \mu_B(x). = 1 - \mu_A(x)$$

Example :
Let $\underset{\sim}{A} = \{ (x_1, ·3) , (x_2, 1), (x_3, 0), (x_4, ·2)\}$
$\underset{\sim}{B} = \{(x_1, ·7), (x_2, 0), (x_3, 1), (x_4, ·8)\}$
Then $\underset{\sim}{A}^c = \underset{\sim}{B}$. so $\underset{\sim}{B}^c = \underset{\sim}{A}$,

(3) Intersection and Union :
Suppose $\underset{\sim}{A}, \underset{\sim}{B} \subset X$.
then for $\underset{\sim}{A} \cap \underset{\sim}{B}$,
$\mu_{A \cap B}(X) = \min \{\mu_A(x) , \mu_B(x) \}, x \in X$
and for $\underset{\sim}{A} \cup \underset{\sim}{B}$,
$\mu_{A \cup B}(X) = \max \{\mu_A(x) , \mu_B(x) \}, x \in X$

Example :
Let $\underset{\sim}{A} = \{(x_1,0), (x_2, ·5), (x_3, ·2), (x_4, 1), (x_5, ·7)\}$
$\underset{\sim}{B} = \{(x_1, ·1) , (x_2, ·2), (x_3, 0),(x_4, ·5), (x_5, 1)\}$
Then
$\underset{\sim}{A} \cap \underset{\sim}{B}, = \{(x_1,0), (x_2, ·2), (x_3, 0), (x_4, ·5), (x_5, ·7)\}$

$\underset{\sim}{A} \cup \underset{\sim}{B}, = \{(x_1, ·1), (x_2, ·5),(x_3, ·2), (x_4, 1),(x_5, 1)\}$
(4) Disjunctive sum of two sets :
Let $\underset{\sim}{A} , \underset{\sim}{B} \in X$. Then
$$\underset{\sim}{A} \oplus \underset{\sim}{B} = (\underset{\sim}{A} \cup \underset{\sim}{B}^c) \cup (\underset{\sim}{A}^c \cup \underset{\sim}{B})$$

From the above operations we can get the properties of sets in fuzzy subsets also as Commutative property, Associativity, Idempotency, Distributivity, De Morgan's Law etc. But we have some particular cases when the fuzzy subsets are different from the ordinary subsets. For example
1. In ordinary set thory $\underset{\sim}{A} \cap \underset{\sim}{B} = \Phi$ if $\underset{\sim}{A} \subset \underset{\sim}{B}^c$. But in fuzzy subsets the reverse is not true necessarily .

In ordinary set theory,

2. (i) $A \cap A^C = \Phi$, (ii) $A \cup A^C = X$

But in case of fuzzy subsets they are not true. We can see these easily taking some examples.

Fuzzy Point

As from ordinery sets to fuzzy sets (by means of the charecteristic function) a similer generalisation may hold in difining the concept.

Definition:

A fuzzy point p in a set X is a fuzzy set in X and its charecteristic function takes the value 0 for all x in X except one say x. If $\mu_p(x) = t$ then $p = \{(x, t)\}$

In this way now fuzzy subsets theory is a very vast and interesting topic in Mathamatics. Every side of set algebra like topology, metric spaces, groups, Rings etc. Are discussed in fuzzy subsets also.

Some Books about Fuzzy subsets. "

1. Fuzzy sets and system - L.A. Zadeh.
2. Fuzzy sets as a basic theory of possibility - L.A. Zadeh.
3. Application of Fuzzy set theory - Lee Samuel C.
4. Interoduction to the theory of Fuzzy sets - A. Kauffmann.
5. Fuzzy Algebras - C. L. chang.

o-o

* * * *

From a glass of milk, one third is drawn off and the glass is filled up with water; one third of the mixture is then drawn off and the glass is again filled up with water. After this process has been repeated four times, what will be the ratio of milk to the water in the resulting mixture?

Leisure Time for Students

☐ *Niranjan Mahanta*
Lecturer, Dept of Education

'The art of living in itself is a vocation and needs a training in much the same way as well as earning a livelihood'
                                                    Adams.

How to spend leisure time seems to be a new problem not only among students but also among the people of different age groups. Because, leisure implies a period of rest or relaxation with out absence of works. The wholesome utilization of leisure represents any socially accepted leisure the persuit of which gives an individual to apply one's own choice.

With the development of science and technology we find in every field specialization and division of labour. Introduction and development of machineries day by day with rapid industrialization has reduced work hand, labbour and time, which ultimately results in leisure time. This is the reason why the problem of leisure comes to the fore- front of modern society. This problem can be solved only by worthy use of leisure. So it is now a growing demand that the younger generation ought to be trained in properly to use their leisure time in the best possible way.

There fore, we can consider the following activities for worthy use of leisure time.

In order to provide meaningful use of leisure students may be encouraged to organize hobby centres for the cultivation of their hobbies to make life lofty with collection of stamp, coin, picture and other rare things such as old books, old magazines etc.Students may also be engaged in the collection, identification and plantation of different plant which will lead to save our environment and maintain ecological balance. Such activitics will not only creat enthusiasm amang students but will also help them to utilize their leisure time properly and the same would lead our society fowards development in right direction.

Reading is one of the commonest habits amongs tudents.There fore students can use their leisure time in reading various types of good books and magazines.

Indoor and outdoor games, organization of sports,festivels, organization of geographical clubs, swimming clubs, dramatic society,debating clubs,music clubs, literary clubs etc.also help tremendously in the formation of good habits among students.

For the worthy use of leisure it is necessary to arrange picnic, excursion, social service etc. which supplements the know ledge of art and culture of different society and will also fulfil the needs and interests of students.

But the most important thing which one should keep in mind while selecting leisure time activities for students are as follows .

In the selection of leisure time activities, proper attention should be paid to the recreation or relaxation of mind of students.

Different typs of activities for the varied needs and interests of students should be provided.

Selection of leisure time activities should be guided by the principle of **individual tasks and** temperaments.

The activities which give mental pleasure to develop the innate abilities of students should be taken into consideration.

Leisure time activities should be introduced with a view to unfolding the natural, personal traits of students.

So finally we may conclude that leisure time activities help in developing the creative talent and artistic sense of students and help them to spend their free time wisely. In this regard, the teachers of schools, colleges and universities should play a vital role by providing various facilities in guiding students for healthy use of leisure time. For the worthy use of leisure, the teacher should organize social, literacy, cultural and other programmes in the educational institutions. Society and the voluntary organization can also play a positive role in this aspect . Because the child of today is the citizen of tomorrow and our prime duty is to build up the better and fruitful life of students for future which is very important for the upliftment of a society and preparation for new millennium. ****

"Everybody is good as it comes from the hands of the Author of Nature, but everything degenerates in the hands of man"
— Rousseau

The Entrepreneurship : Its Concepts

*Bijaya Deka,
Lecturer, Education Deptt.

Nowadays unemployment is the most burning question to the nation alongwith the increasing population. Youths are getting frustrated as a result they are diverting towards destructive activities . These are all due to lack of proper guidance from the part of parents, teachers and due to our prevailing systems and situations. Most important thing for our students is proper guidance and that can be in the form of proper information given to them so that they themselves may decide what to do and what not . But there should be a source from where they can have all the information and guidance whenever they need it 'What' to do and 'How ' to do problems arise after completing their studies. For this purpose if an *Information Career Guidance Cell (ICGC)* is there with the educational institution itself then it can serve both the purposes together.

Generally college education itself is not enough to prepare students to take up self - employment and entrepreneurial career. Even those who study commerce, science and engineering and technical education in college and University do not generally consider taking up entrepreneurial career. These perhaps happen because the students acquire knowledge of the subject they study, but they do not acquire skill to use their knowldge in practice. This is partly because of the fact that many subjects are not vocational oriented and in many other vocational oriented subjects students are not made aware of the opportunities for self-empoyment. Many students again remain unsure about the type of career they could aspire. They do not develop sufficient motivation to take-up self-employment. They are not aware about the support system and other information required to take the first step in their entrepreneurial career.

In this regard the ICGC may help them for obtaining sufficient knowledge about what they will do. The ICGC may arrange some seminars, workshops, discussions, special talks on prominent entrepreneurs, essay competition among students for their awareness. The ICGC may take help and cooperation from some NGO's to perform their purpose where nesessary. Parents may be invited for positive attitudes, so that they also encourage their wards for entrepreneurial activities.

The Entrepreneurship:

Entrepreneurship plays an important role in developing and contributing to the economy of a nation. The scope of entrepreneurship is wide ranging but for the purpose of our understanding we have simplifed the concept. It is a process of creating something new and assuming the riskes and rewards and it helps a person to be aware about opportunities for self-employment. It is the dynamic process of creating incremental wealth.

Entrepreneurship is the ability to create and build a vision from practically nothing: Fundamentally it is a human creative act. It is the application of energy to initiating an enterprise or organisation, rather than just watching or analysing. This vision requires a willingness to take calculated risks-both personal and financial and then to do everything-possible to reduce the chances of failure