## *Editor's Message ……*

Teaching and learning is evolving due to the impact of the Internet. Now a days, teacher cannot teach students in the same manner in which they were taught. Change is inevitable to engage students not only in the curriculum but also to train them in the diversified field of life. Being new technology is common, new thinking is rare. Keeping this Vision and Mission in mind, our institute brings out e-journal, JBNB-2018 on the occasion of National Science day, 28th February, 2018.The theme of the journal is 'Science Education'.

This issue includes ICT for Quality in Teaching-Learning & Evaluation, Ultrasonic properties of Green and meat coconut water, Photoluminescence exhibited Red emission under near-UV excitation, Financial Derivatives and Partial Differential Equation, Calcium ferrite nanoparticles, railway gate control system using atmega8 , Poverty in Urban India , Noise level during Ganesh festival and Spectroscopic analysis of natural products ,

We shall keep trying to build up substantial support for the journal to strive for a more consistent higher standard of publication.

We greatly appreciate the efforts of all the authors and students for their immense efforts and contribution.

**"*The whole purpose of Education is to turn mirrors into windows*." - Sydeny J. Harries**

Dr. (Mrs.) M.K.Pejaver

Dr. (Mrs.) A.S.Goswami-Giri

# Editorial Board

# INDEX



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JBNB

# ICT for Quality in Teaching-Learning & Evaluation

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## ABSTRACT:

This report is on the findings of a Teaching-Learning & Evaluation Study using "ICT" techniques, In which teachers use some ICT techniques to enhance the Teaching-Learning & Evaluation Strategies for our Students. Then we can easily find out the solutions to enhance the Teaching-Learning & Evaluation process.

**Key words:** Educational Paradox,

## INTRODUCTION:

The relevance of Information and Communication Technology (ICT) in Education are having two issues need to understand. The first one is the very meaning of ICT and the expression ICT used instead of computers. The second one is incorporation of ICT for enhancing learning.

The very expression Information and Communication Technology has lots of ideas in it. It is not just using gadgets. The focus is on what is being transacted through this medium. Present era is having information technology and communication technology. Managing of large quantities of information and communicating the same to the concerned people is the need of the hour. Hence, the name ICT. It is a very comprehensive expression. It is not limited to the computers or the internet. It ranges from the use of FM radio to the use of satellite for communication. It includes both the form and essence of communication. ICT has the potential to make learning more experiential. Moreover the large amount of data, visuals available on any topic may be brought to the classroom from all over the world. Therefore, ICT has been considered an emerging area with lots of potential for making educational process more meaningful.

## 1.0 The Study

Integration of ICT in teaching has very important significance on learning attitude of students, creativity, knowledge construction, learning environment, teaching strategies, problem solving skills and understanding concepts using various tools. Learner has opportunity to keep record of information in electronic version and understand different concepts on the basis of self- learning. Different forms of Multimedia channels provide information about content knowledge, understanding of different concepts, variety of approaches and expertise

### 1.1 Purpose

The followings are the aim and objectives of ICT implementation in education:

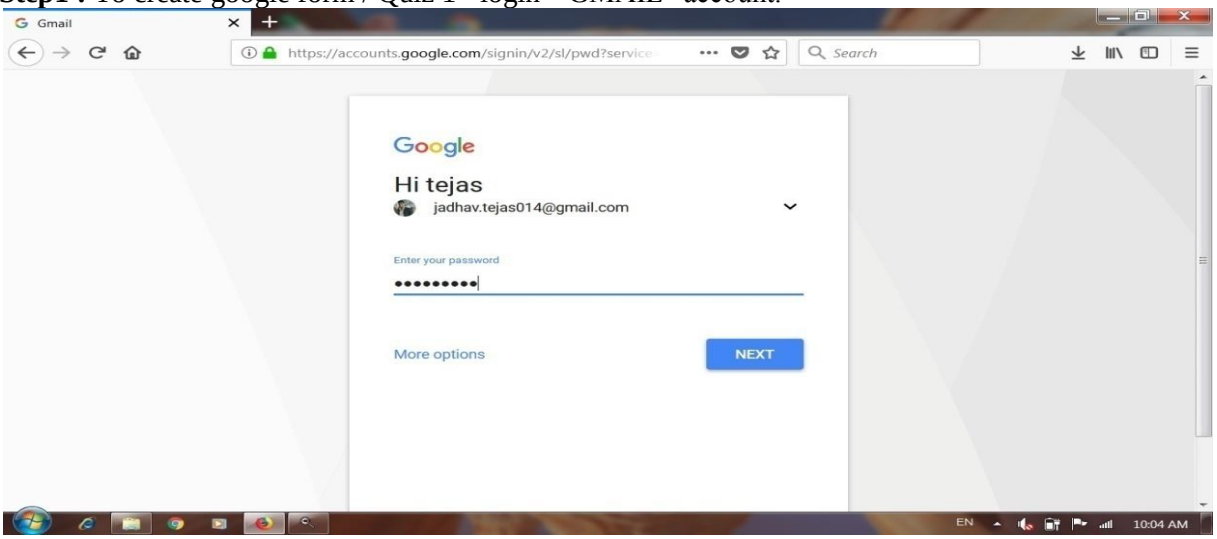
1. To implement the principle of life-long learning / education.
2. To increase a variety of educational services and medium / method.
3. To promote equal opportunities to obtain education and information.
4. To develop a system of collecting and disseminating educational information.
5. To promote technology literacy of all citizens, especially for students.
6. To develop distance education with national contents.
7. To promote the culture of learning at school (development of learning skills, expansion of optional education, open source of education, etc.)
8. To support schools in sharing experience and information with others.

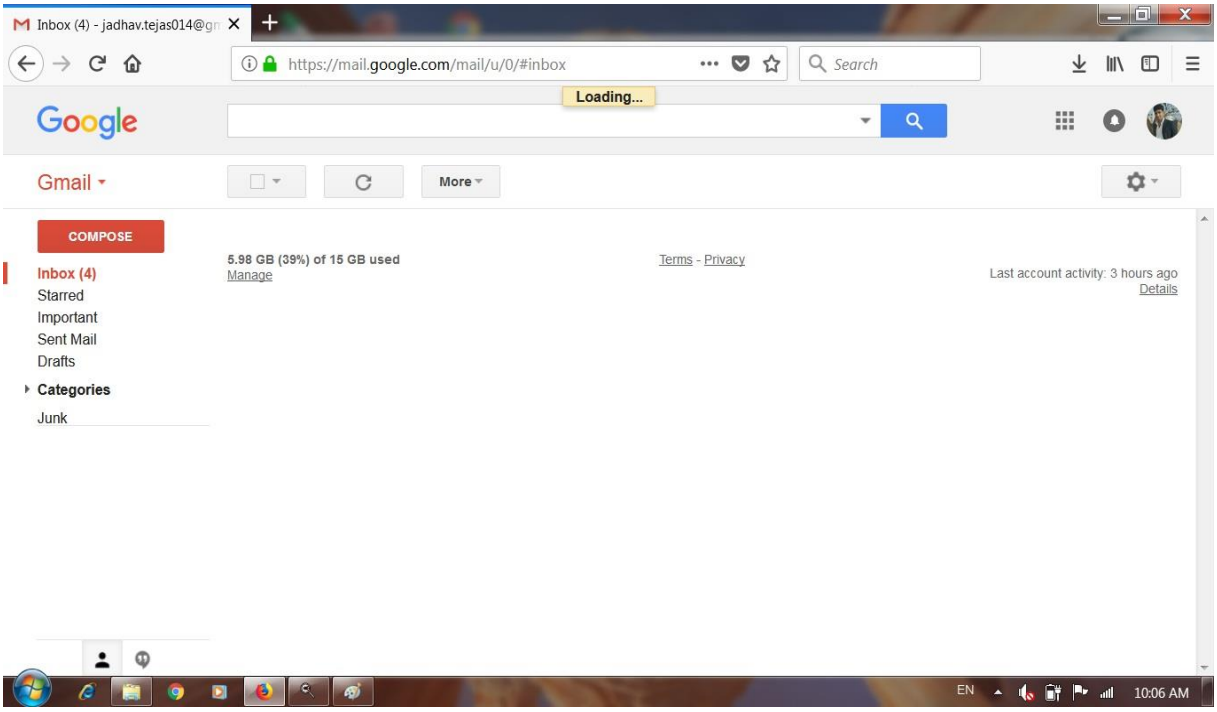
## 1.2 Methods

# A. Google Forms .

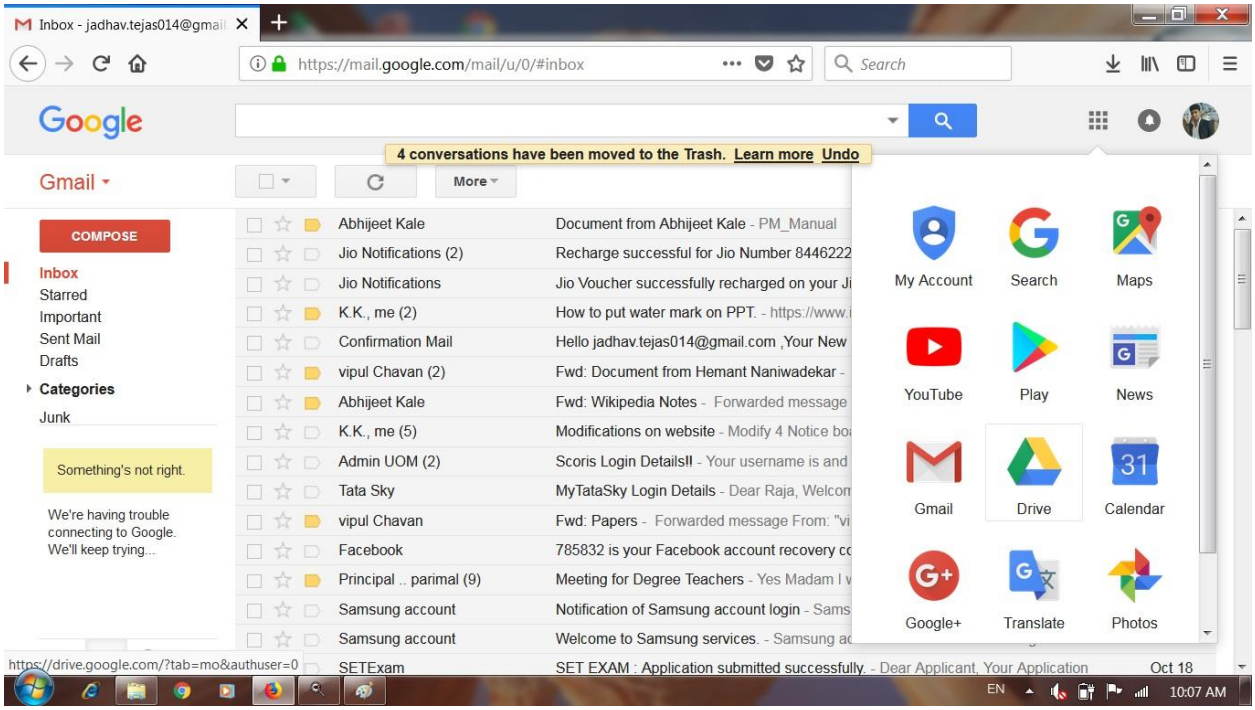
How to create google form or Quiz?

**Step1 :** To create google form / Quiz 1St login "GMAIL" account.

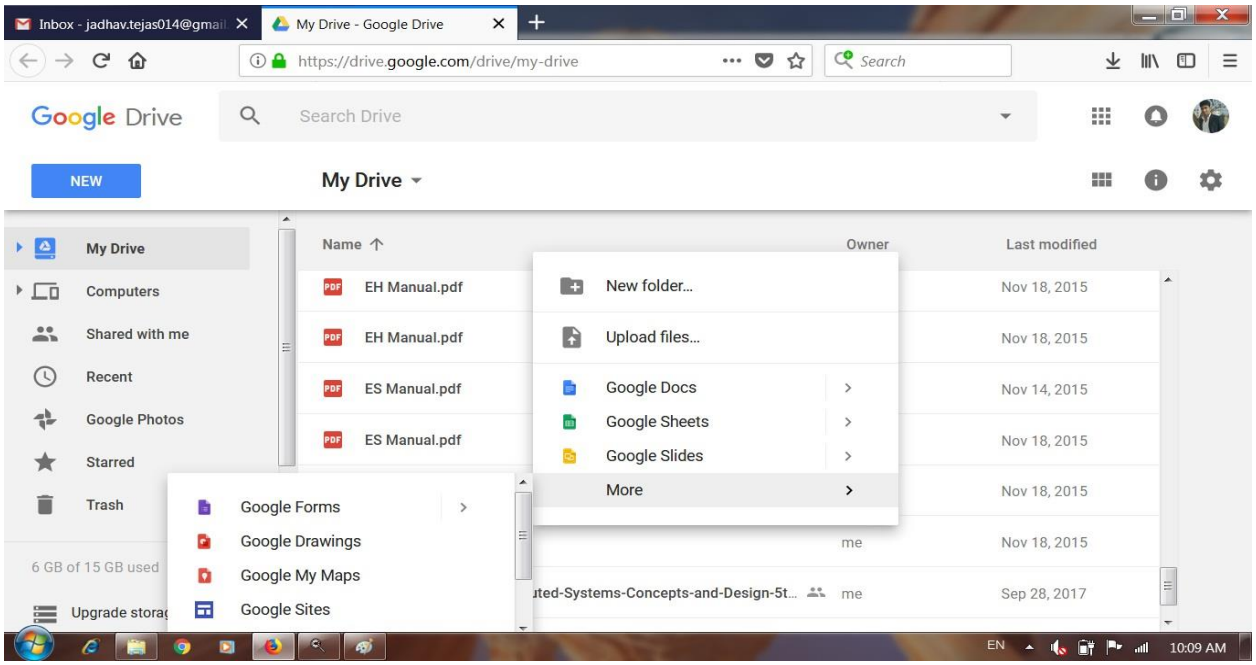


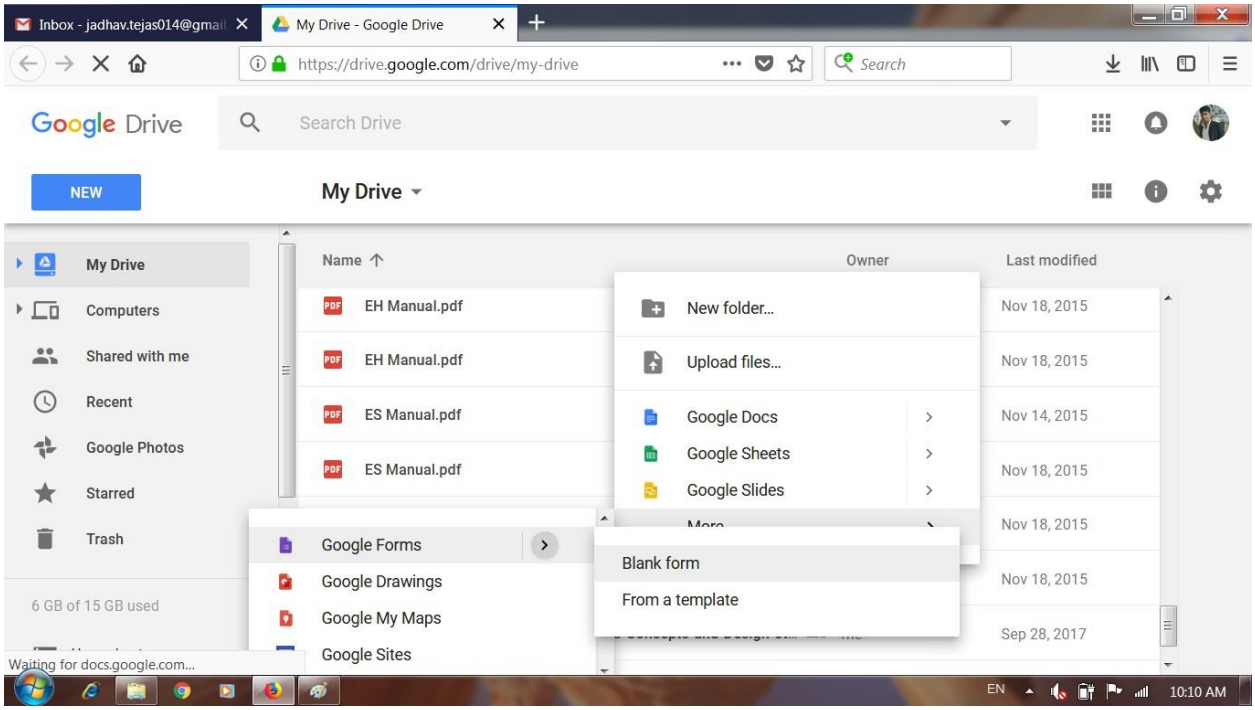




**Step 2:** Once account login is done click on "9 Dots "to open your google Drive (Displayed in below picture ).

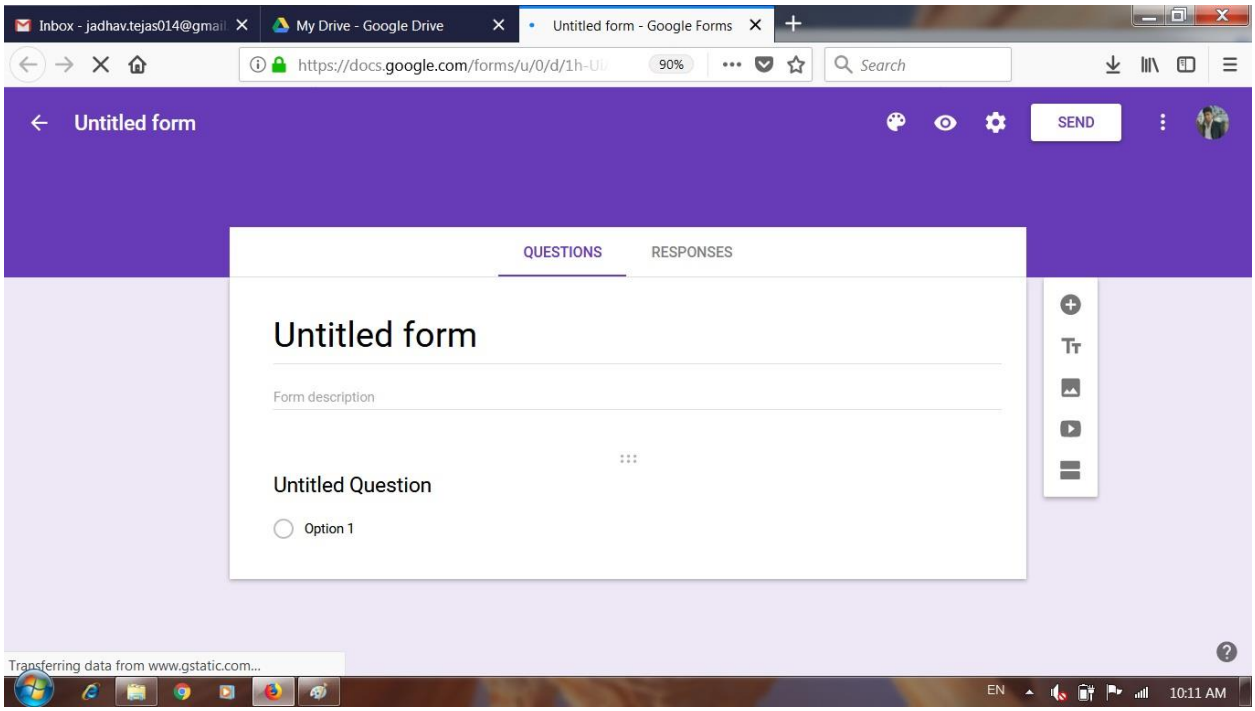


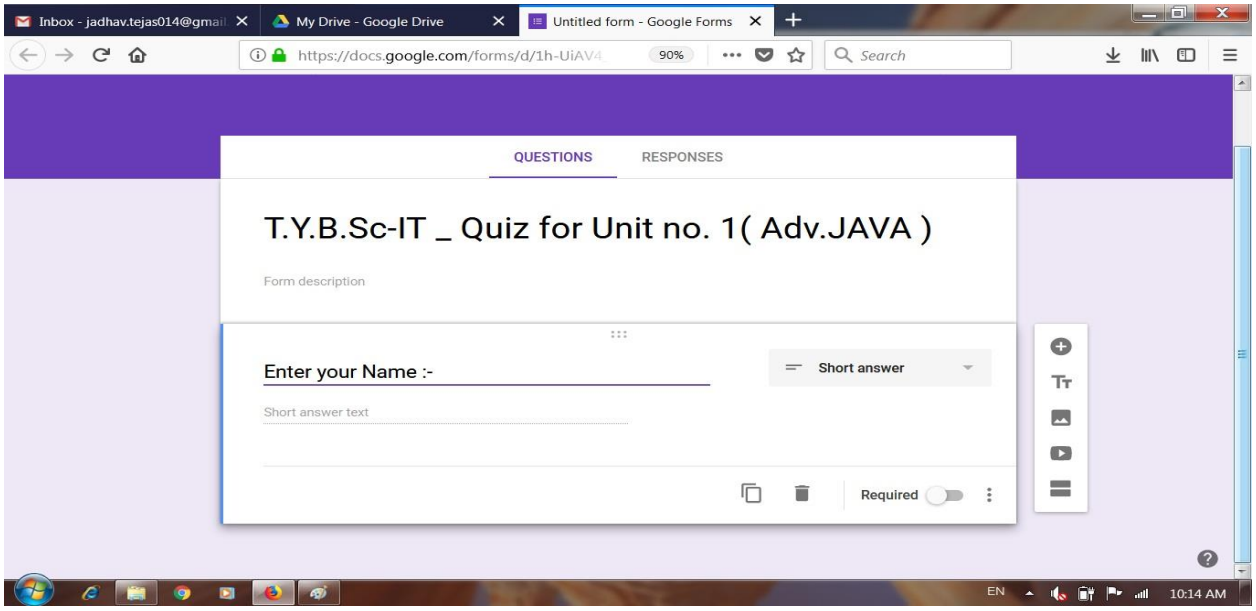

**Step 3 :** Now Right click on Window and Select more option to select google form . And select google form with Blank form.



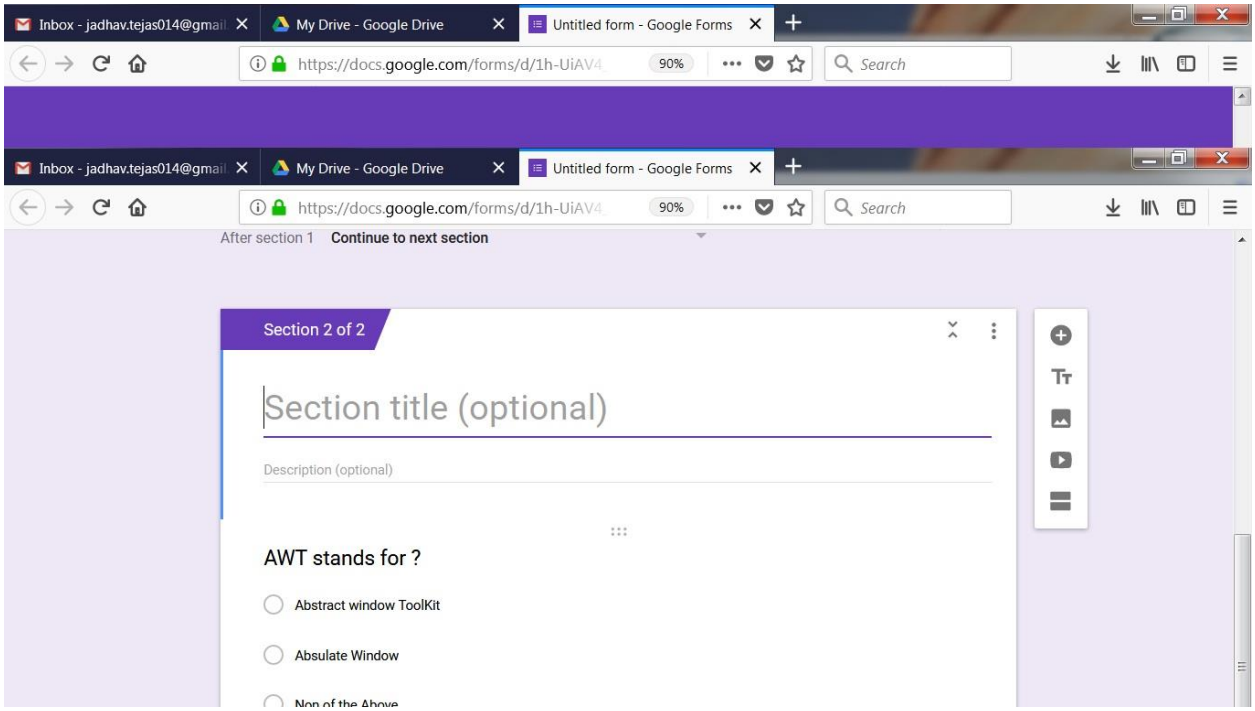



**Step 4 :** Now you will get Blank_Form & we can change properties , headings , themes of form Accordingly .

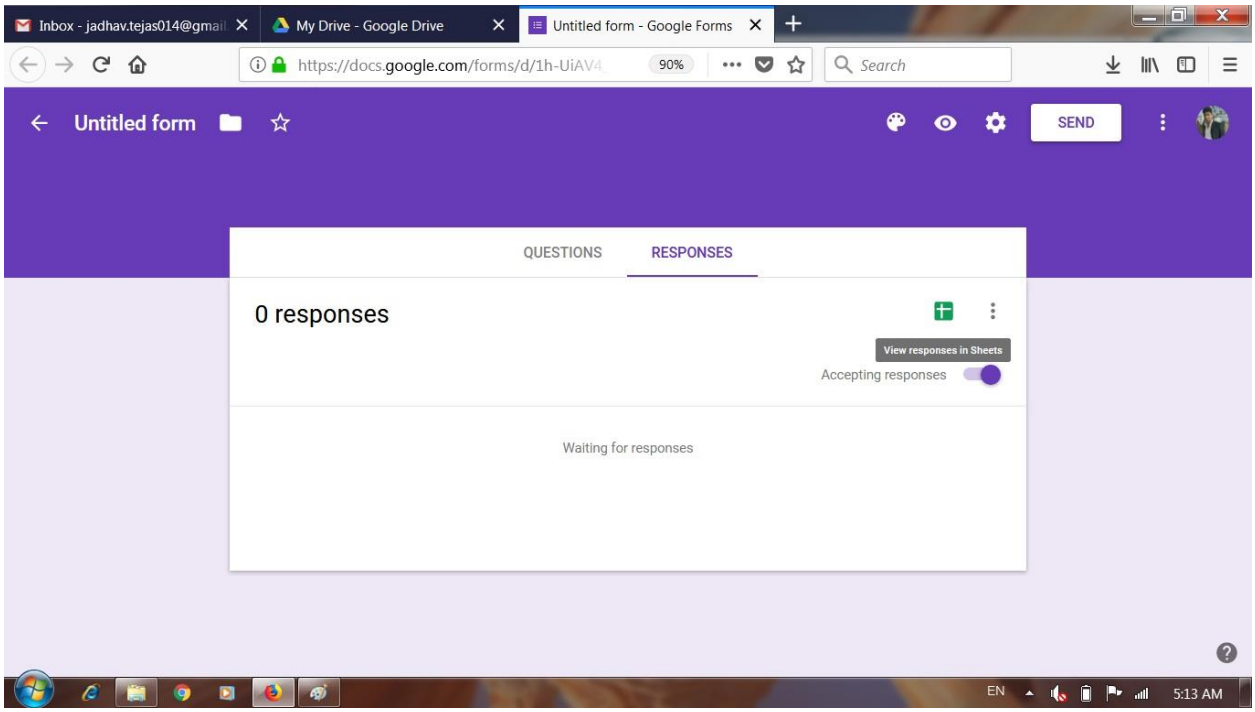




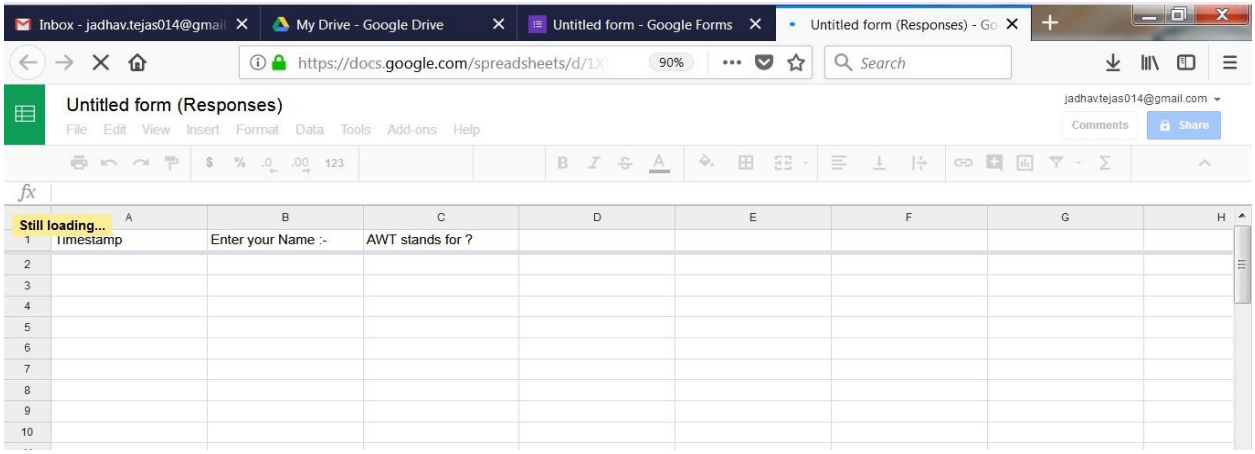

**Step 5 :** You can add All types of Questions in this form like ( Objective types , fill in the blank , one line answer , multiple line answer )




**Step 6 :** Once you ready with form / quiz we have to collect response from students so that's why there is one field using that's field we can collect responses.

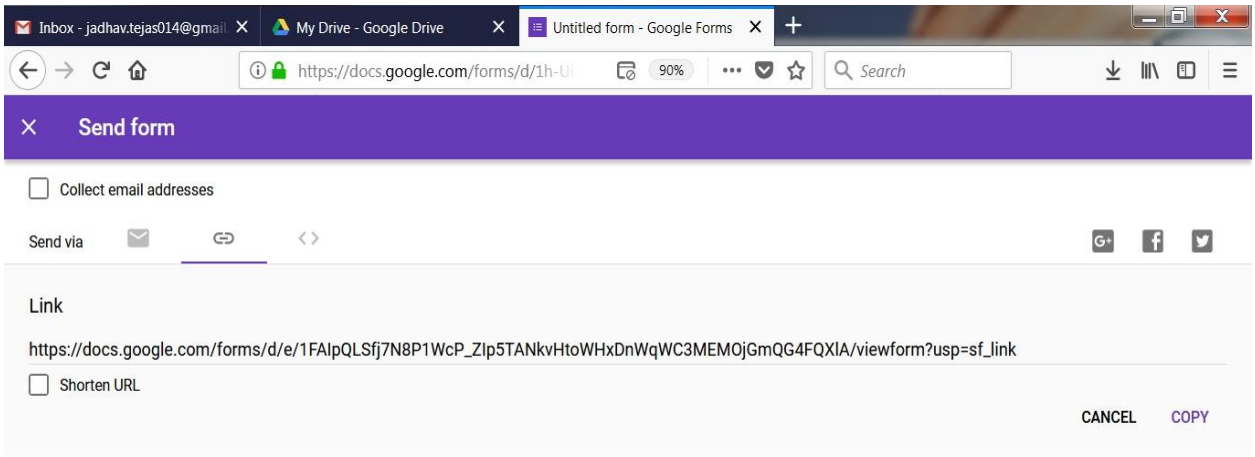



**Step 7:** Again there is one option to create Excel document to create the response file

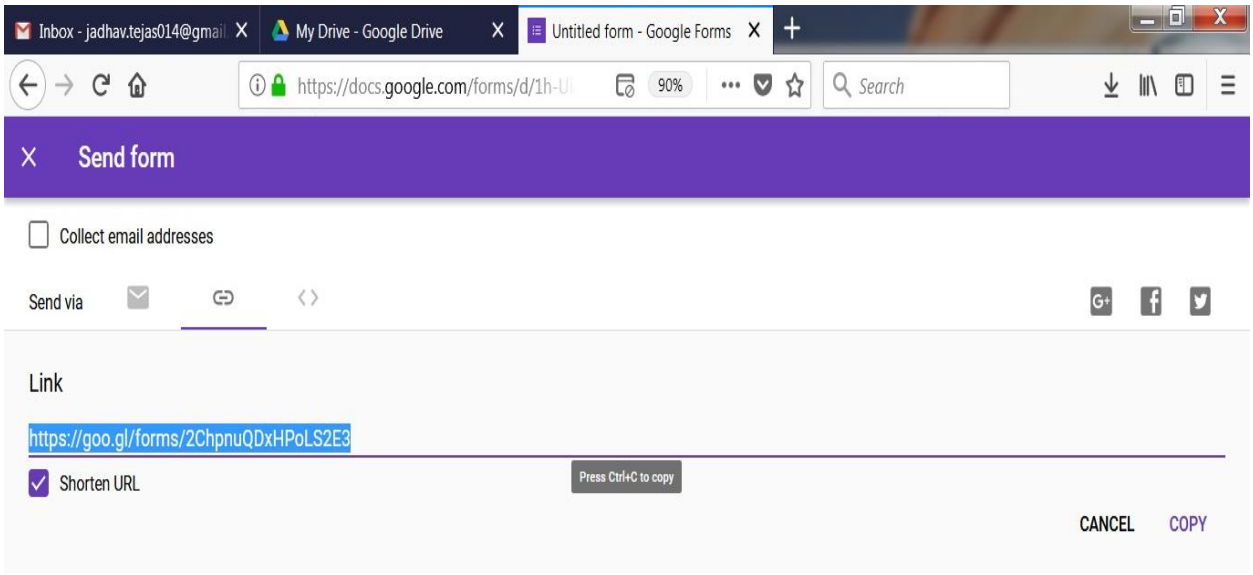



**Step 8 :** If Form / quiz and response files are ready then next part is "How to create link to share with student to attend / solve the quiz " ?

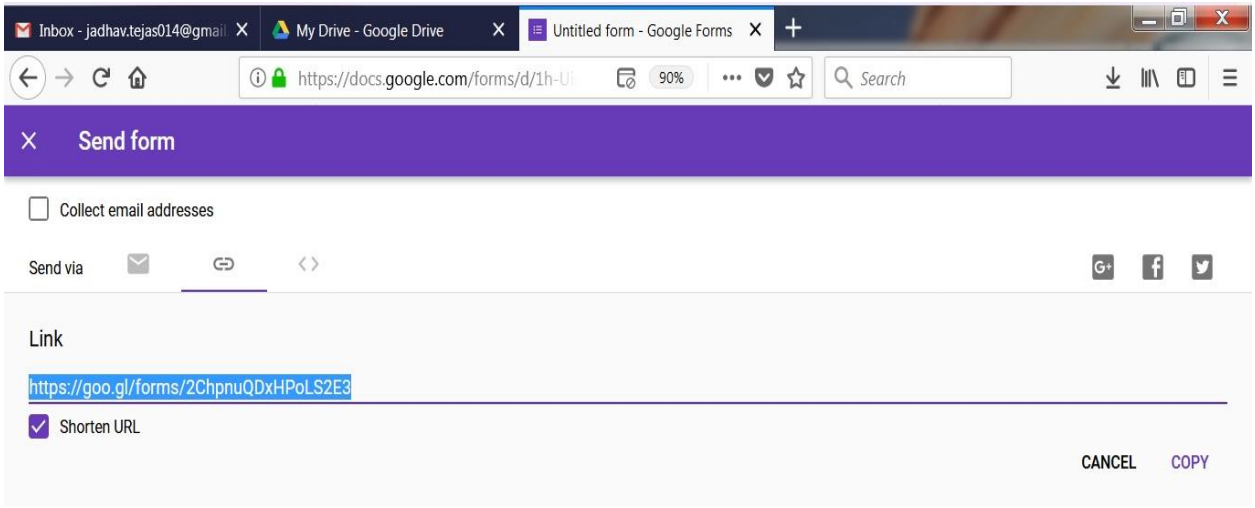
So, there is one option near properties of form "SEND" using that send button we can create "URL" of a quiz.



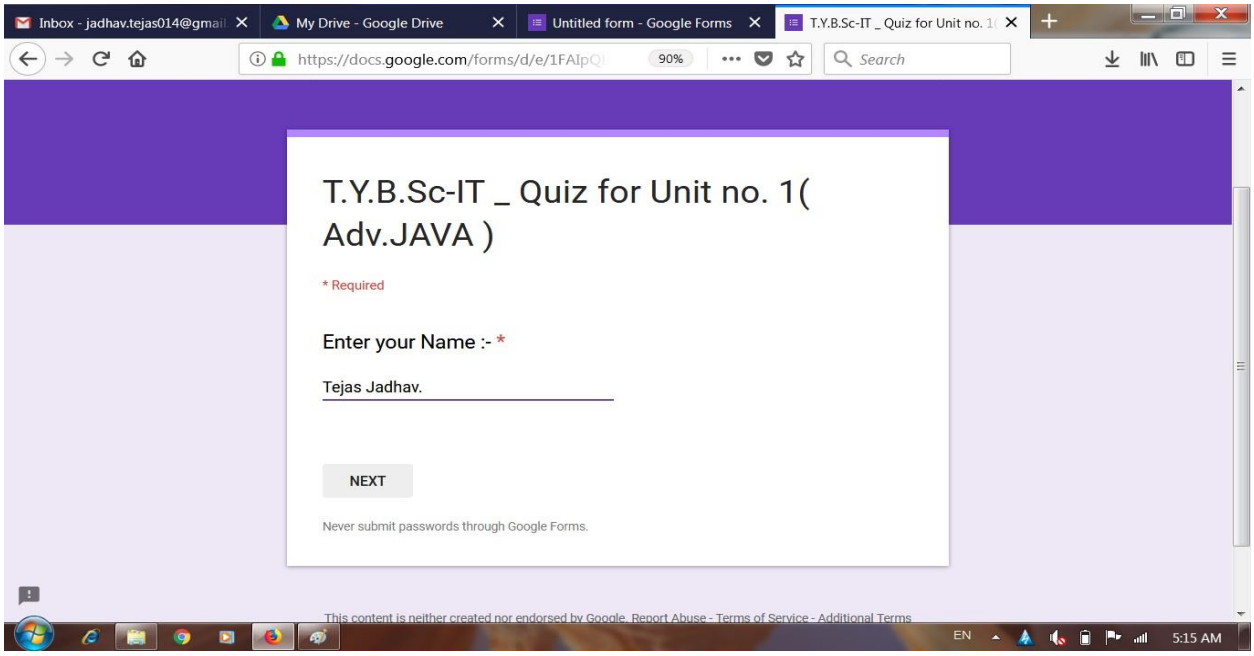

**Step 9 :** Now click on URL shorten to make this URL short to easily access.

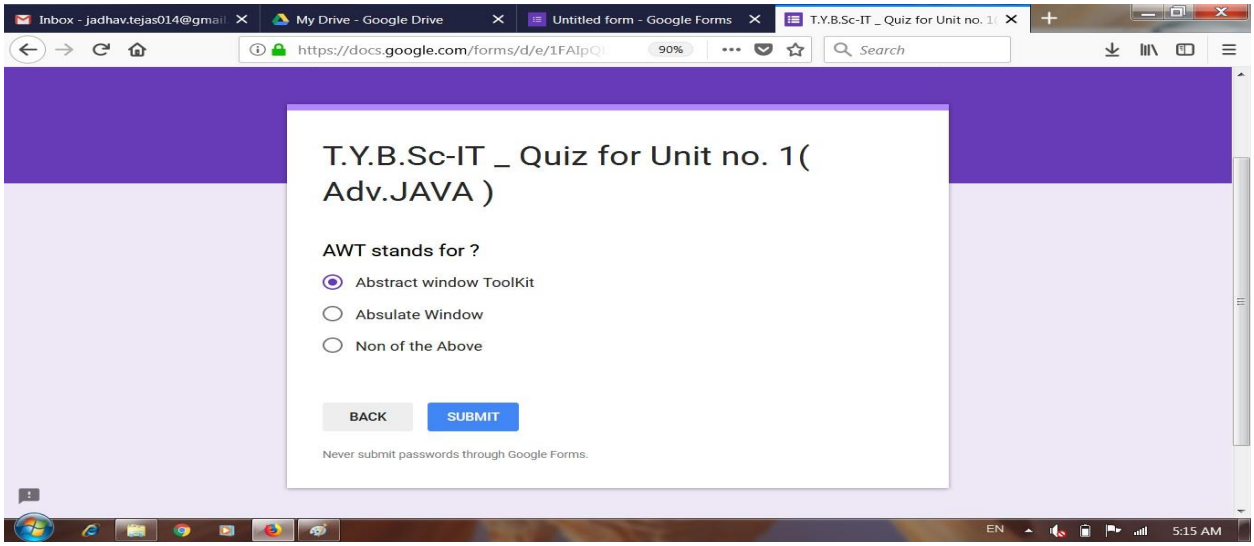



**Step 10 :** Once Short URL is ready we can copy this URL to send with students.




**Step 10** : Its finel stage "students will attend the quiz " with given URL and submit the response.






**Step 12:** You will get the all responses in our gmail account google drive in Excel document.

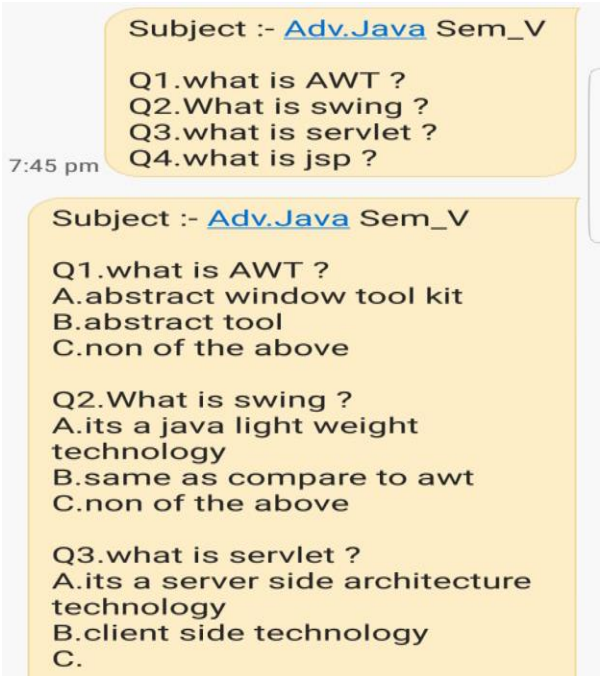
## B. Use of Whats app and SMS .

How to use whats app and SMS in teaching learning &evaluation?

**Step 1:** Basically we are just using whats app and sms for "Time-Pass" but we can successfully use these things in teaching, learning & evaluation. To implement these thing in teaching learning we have to create groups of student in our mobile phones.

**Step 2:** Create a groups of student in our mobile phones / in whats app.

**Step 3:** Now create a questionnaires and forward it in to these groups. And collect students responses.




**Step 4**:

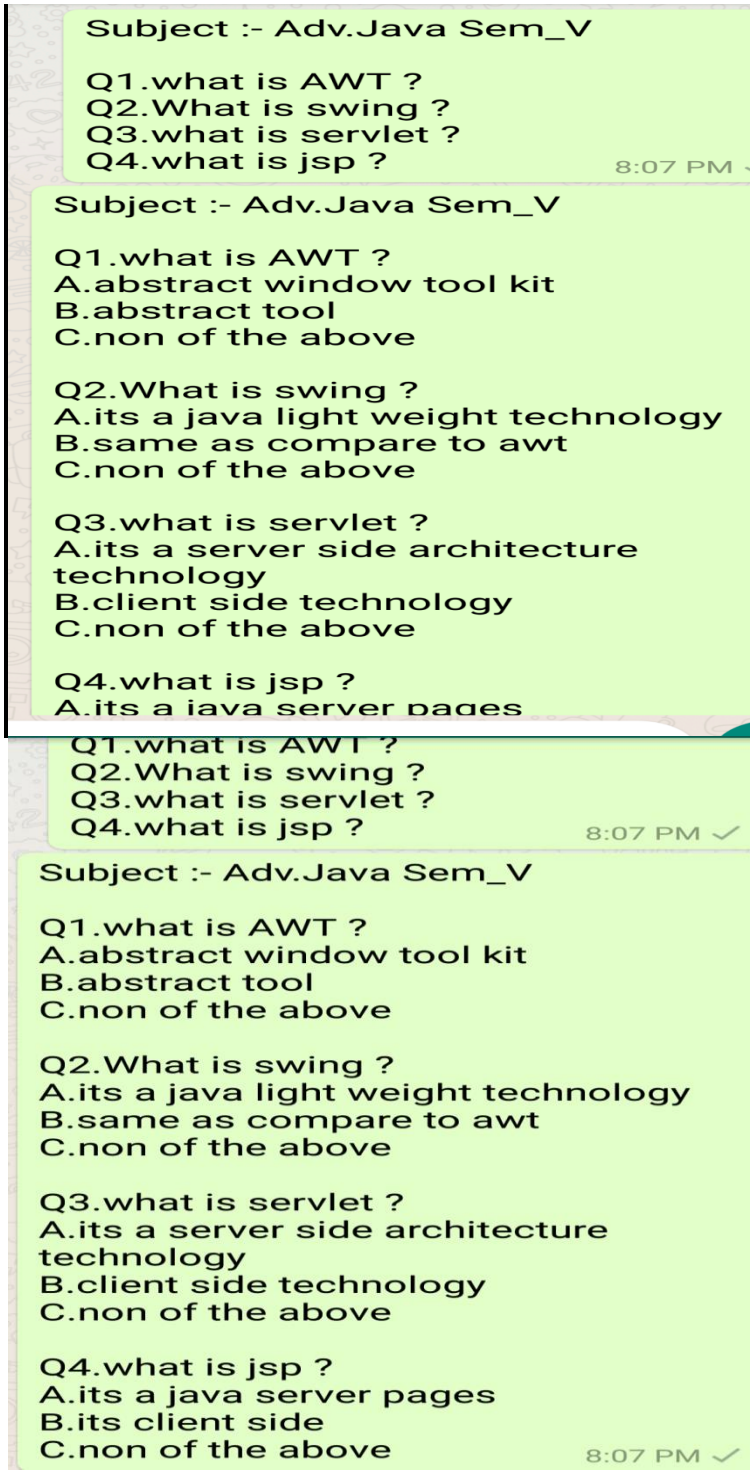
Subject :- Adv.Java Sem_V

Q1.what is AWT ?
A.abstract window tool kit
B.abstract tool
C.non of the above

Q2.What is swing ?
A.its a java light weight technology
B.same as compare to awt
C.non of the above

Q3.what is servlet ?
A.its a server side architecture technology
B.client side technology
C.non of the above

Q4.what is jsp ?
A.its a java server pages
B.its client side
C.non of the above


Subject :- Adv.Java Sem_V
Q1.what is AWT ?
Q2.What is swing ?
Q3.what is servlet ?
Q4.what is jsp ?
8:07 PM
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8:07 PM
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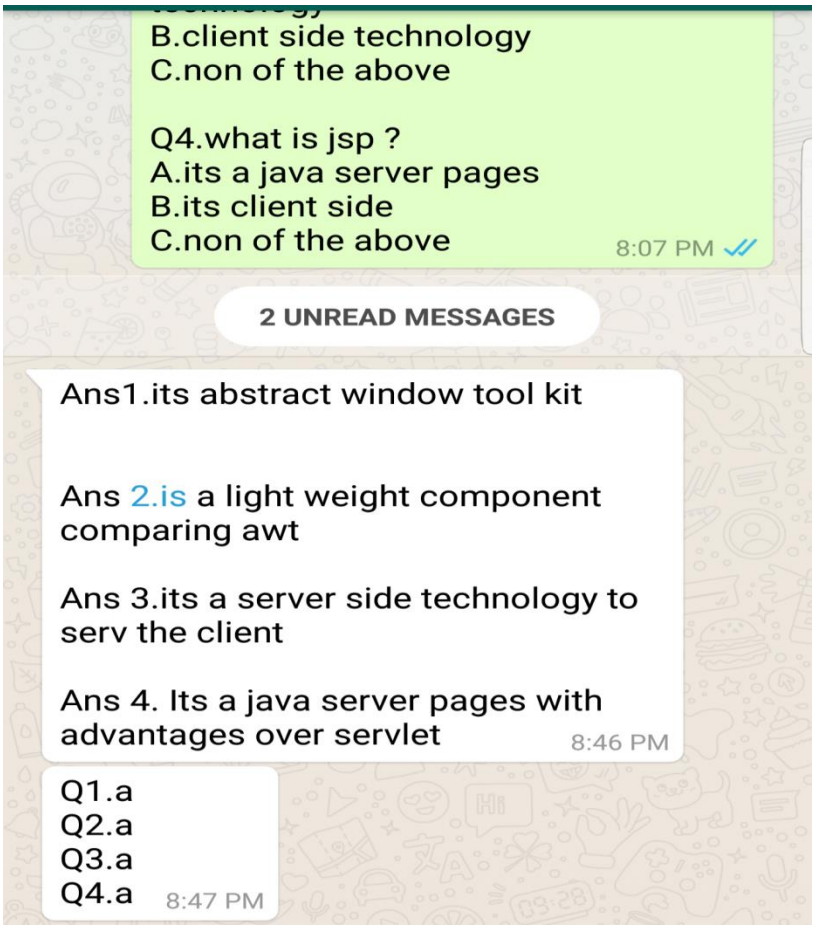
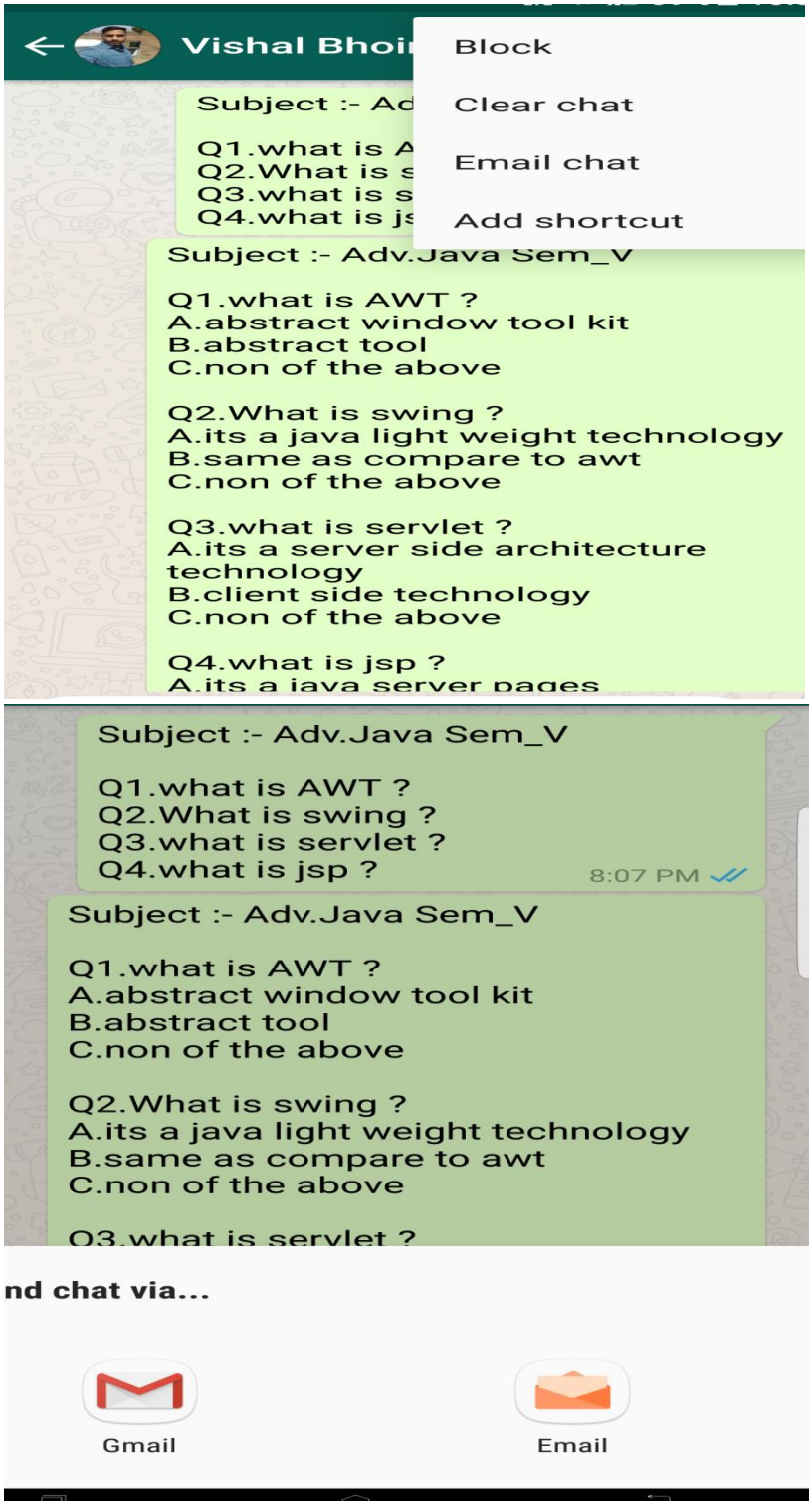
B.client side technology
C.non of the above
Q4.what is jsp ?
A.its a java server pages
B.its client side
C.non of the above
8:07 PM

**Step 5:** And collect responses from Students with respect to "Topic"




**Step 6:** We can stores these activity using emails because its difficult to stores the record of all students every day .so we can mail the cahat as it is and main the data as a activity or record .

**Step 7:** So that click on chat options and select email chat and then we can easily email the chat and maintain the records.( given in below screen shots )


Vishal Bhoi
Block
Clear chat
Email chat
Add shortcut
Subject :- Ad
Q1.what is A
Q2.What is s
Q3.what is s
Q4.what is js
Subject :- Adv.Java Sem_V
Q1.what is AWT ?
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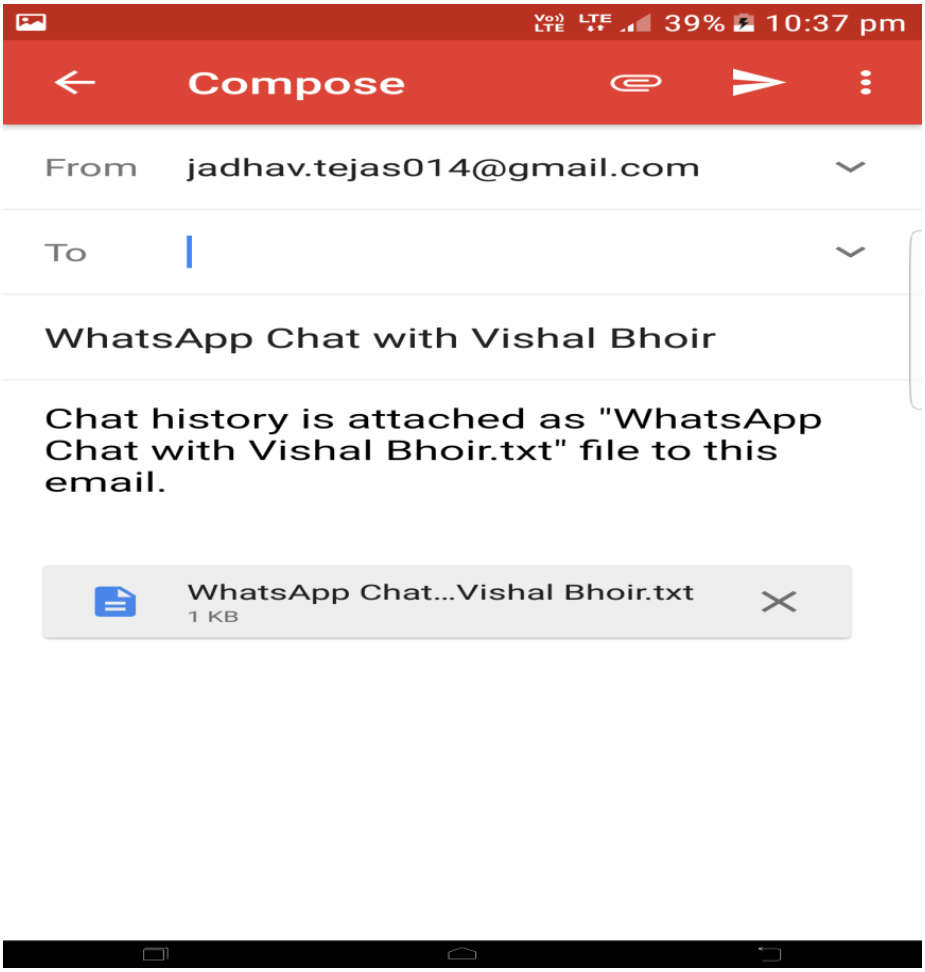
nd chat via...
Gmail
Email


39% 10:37 pm
Compose
From
jadhav.tejas014@gmail.com
To
WhatsApp Chat with Vishal Bhoir
Chat history is attached as "WhatsApp Chat with Vishal Bhoir.txt" file to this email.
WhatsApp Chat...Vishal Bhoir.txt
1 KB

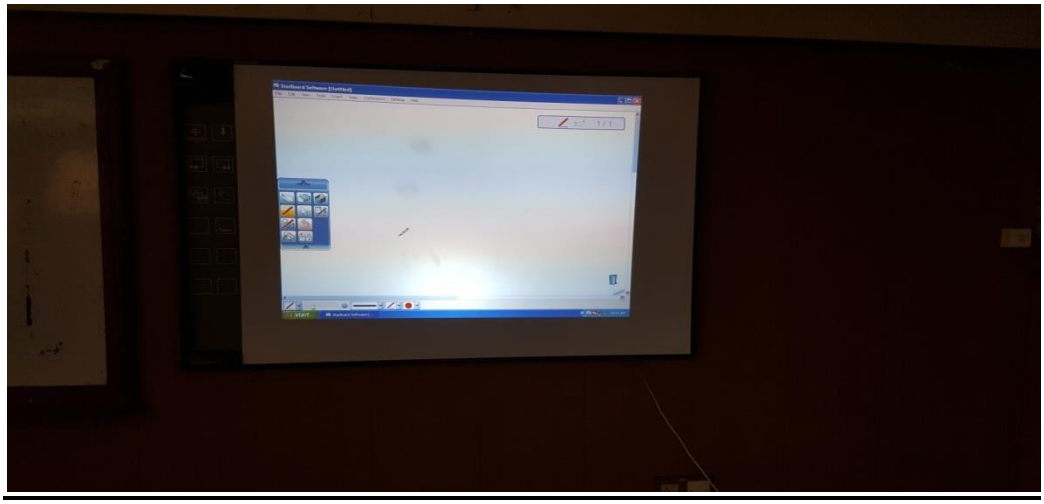
## C. Working with Smart Board .

**Step 1**: Instead of using chalk and board we can use "smart boards"

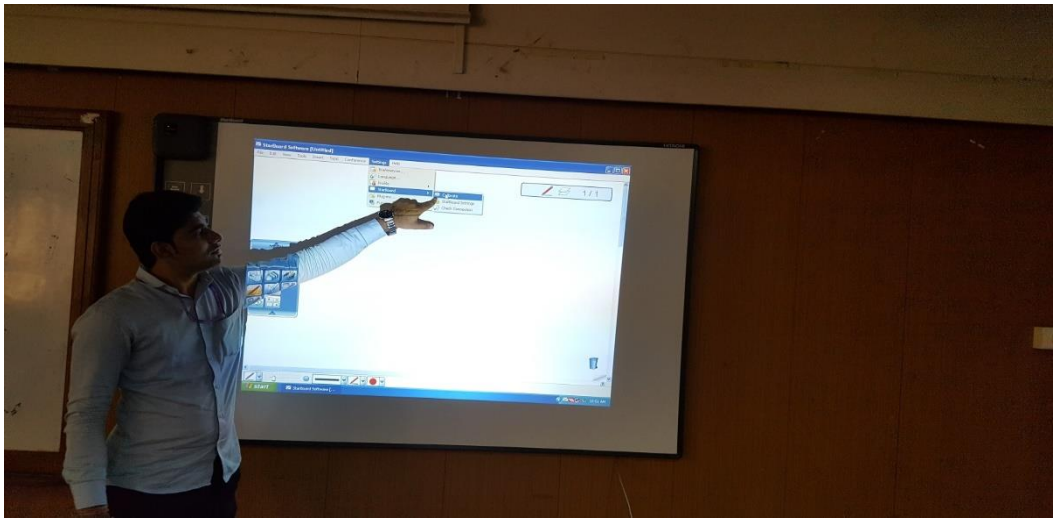
**Step 2**: This is modern technology so there may be possibilities to highly interact with the students.

**Step 3** : One of the software provided by this smart board company i.e "star board " using this software we can do any thing with smart board as a touch screen laptop or screen

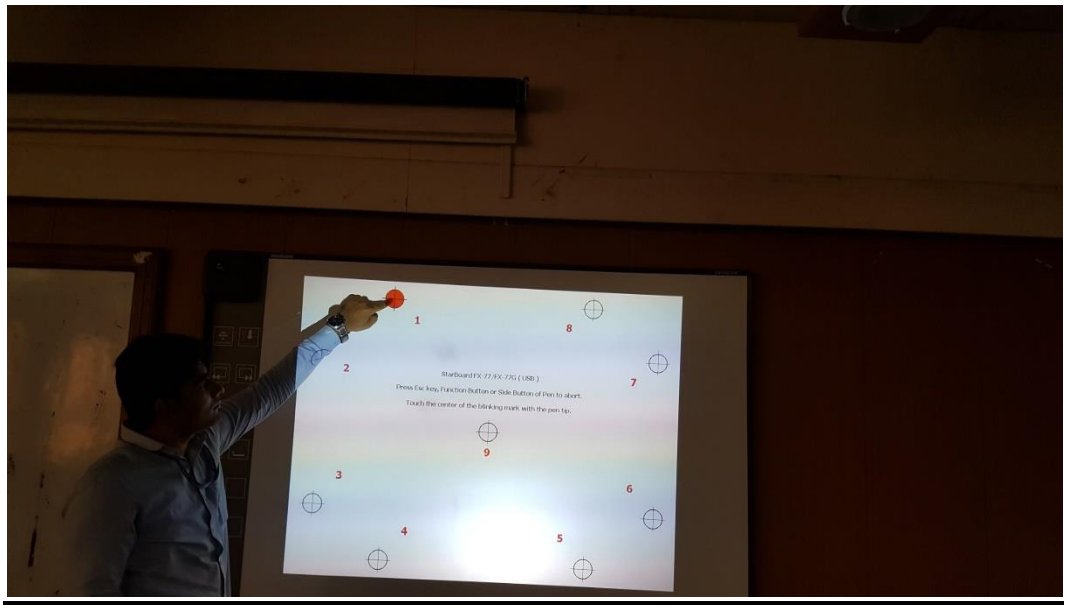
**Step 4** : This is software window of smart board . we can import and export any file for on this spot changes.to do this all things wehave to calibrate the smart board window with projector light / pixels.



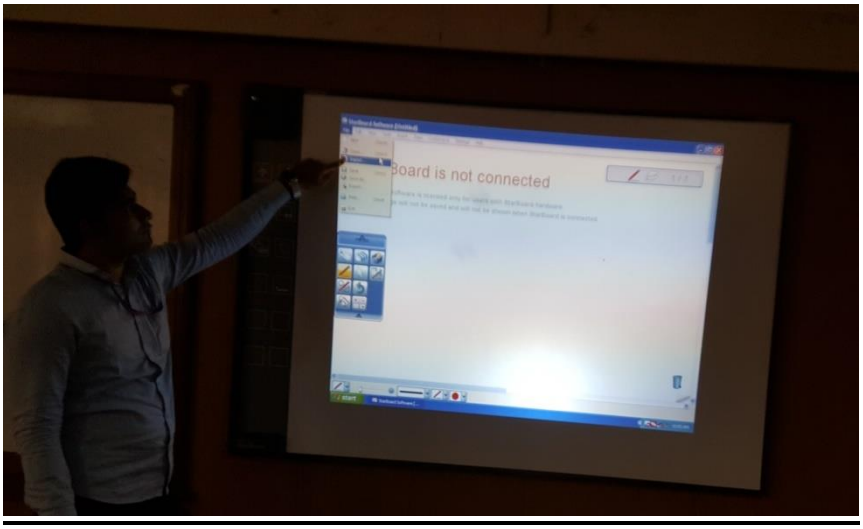
**Step 5**: It's a star board software which we can use for teaching learning as a ICT technique.



**Step 6** :It's a calibrate window to do the accurate connectivity with projector pixels.



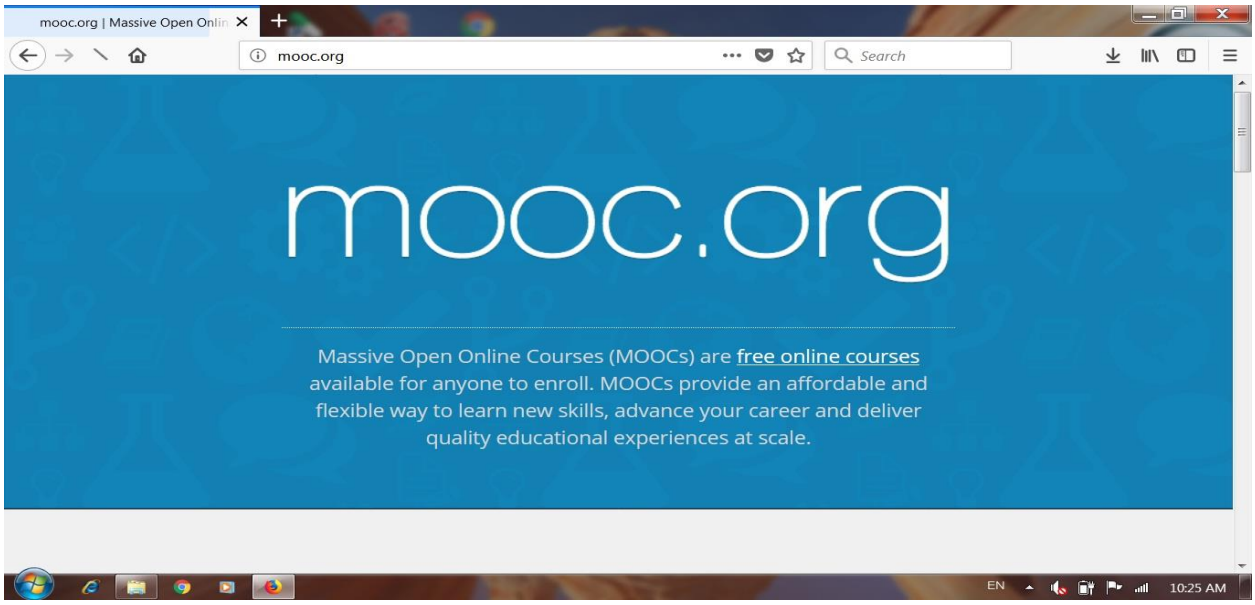
**Step 7** : Because of ICT modern technique . and having advantages of spot changes we can use " smart board for teaching , learning and evaluation " as a ICT technique



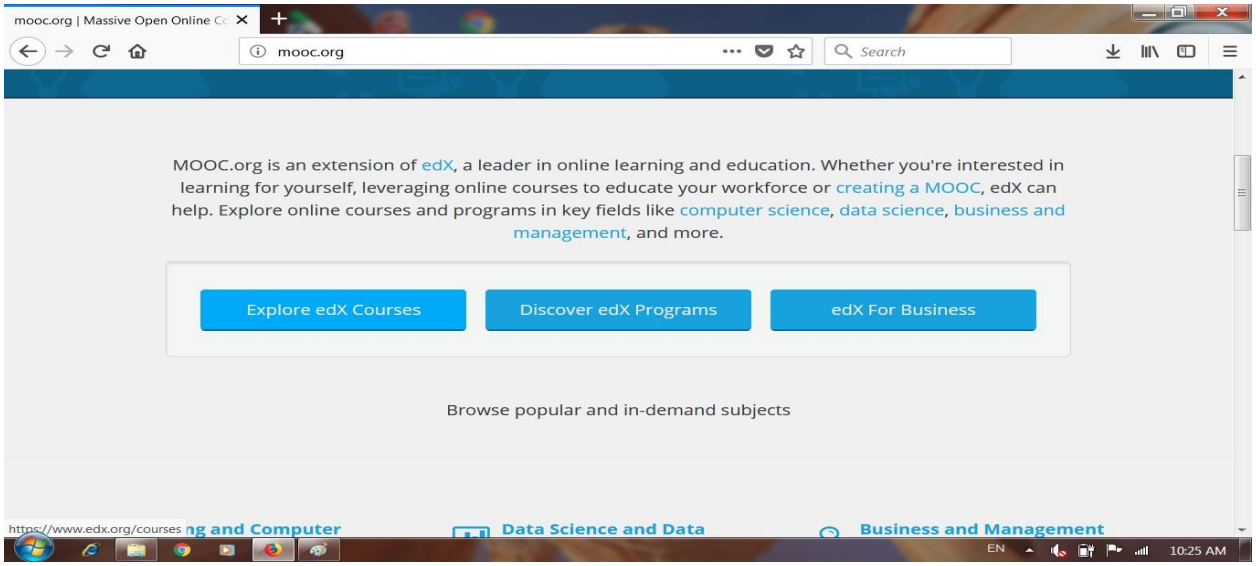

D. **MOOC Courses :**

How to " Login& Register " MOOC Courses

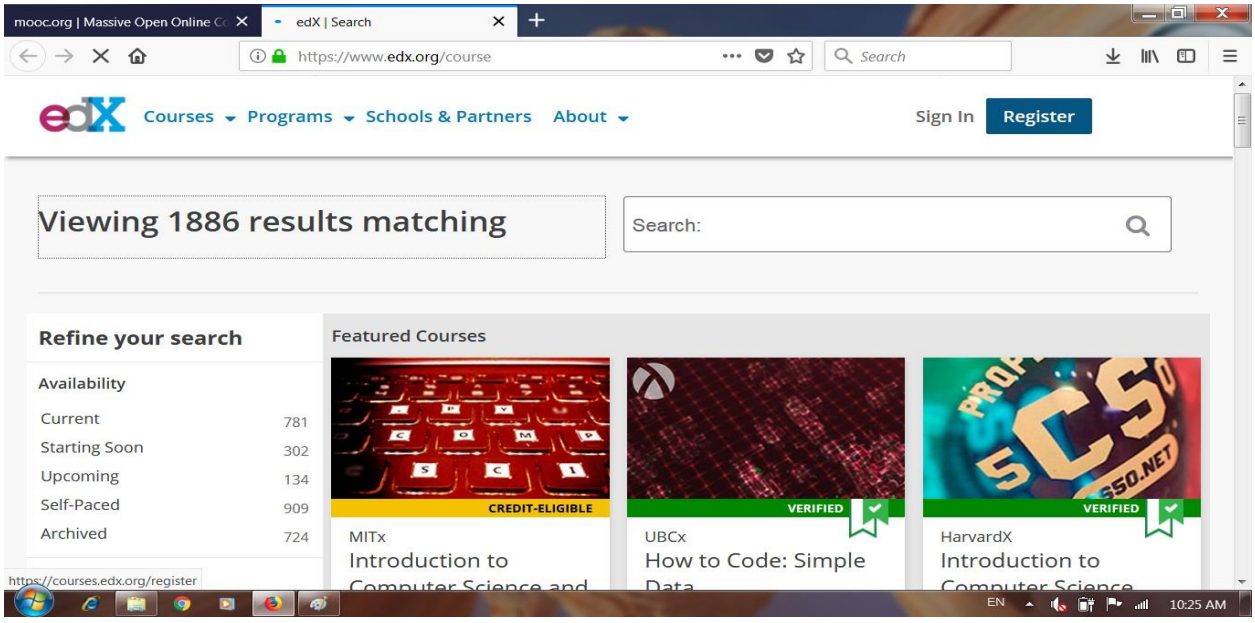
**Step 1**: To" Login& Register " MOOC Courses we have to visit WWW.MOOC.ORG



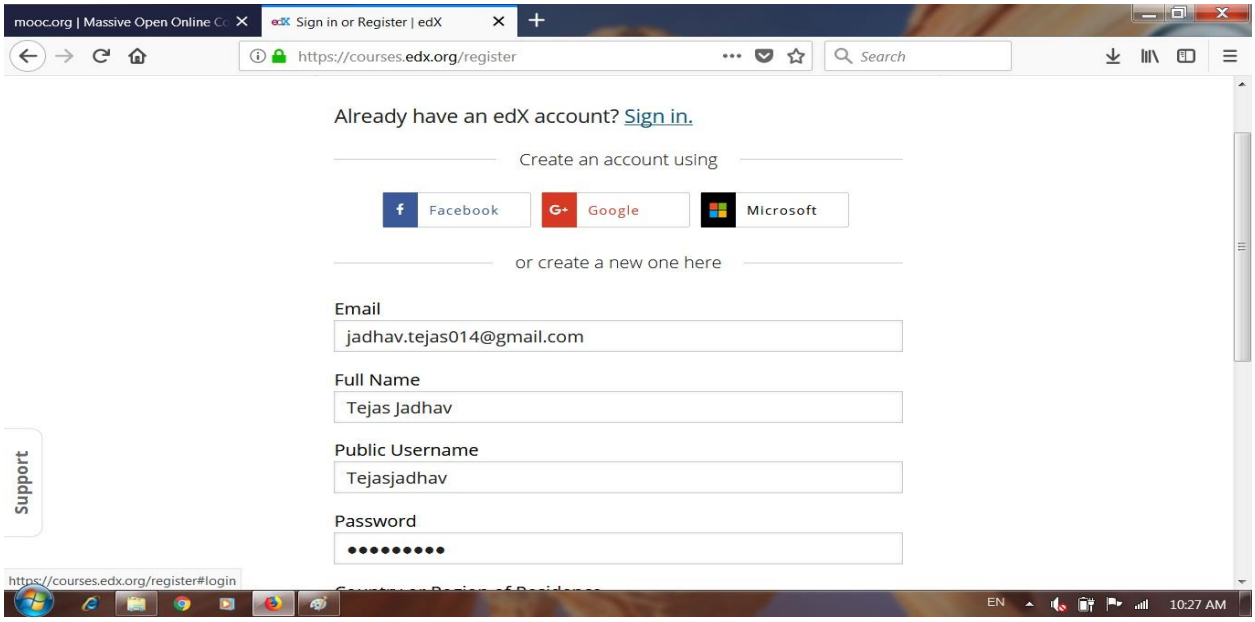
**Step 2** : Now click on "explore eXd courses " ( i.e 1st option on web site )

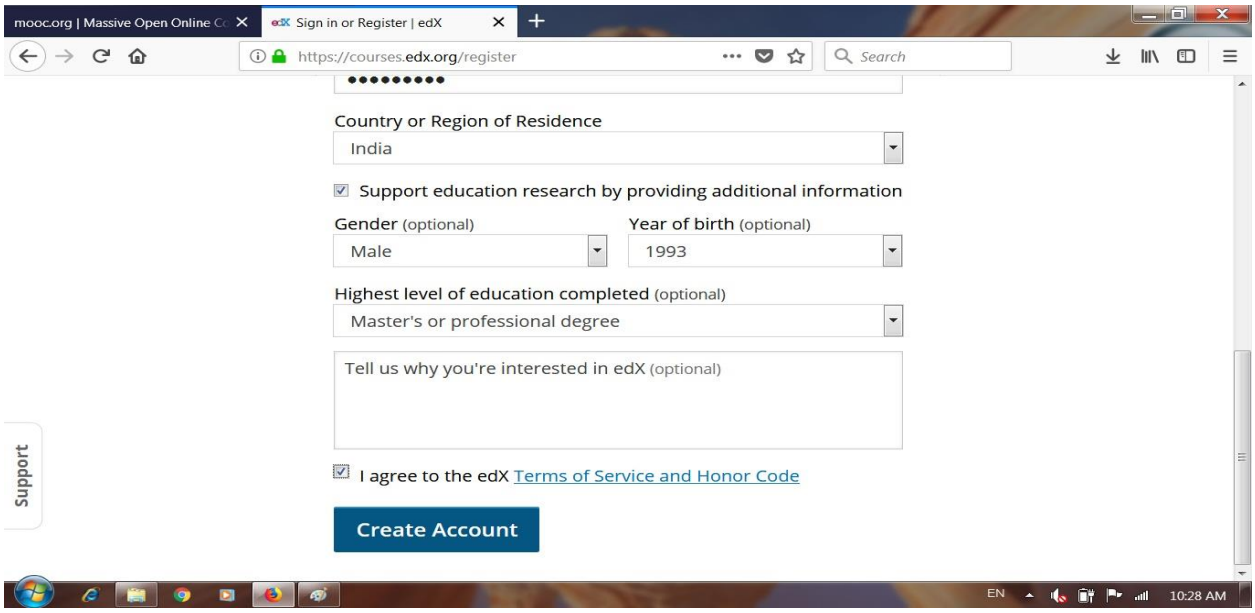



**Step 3** :Now list of courses will display . if we already register then we can apply for any course with login our account.

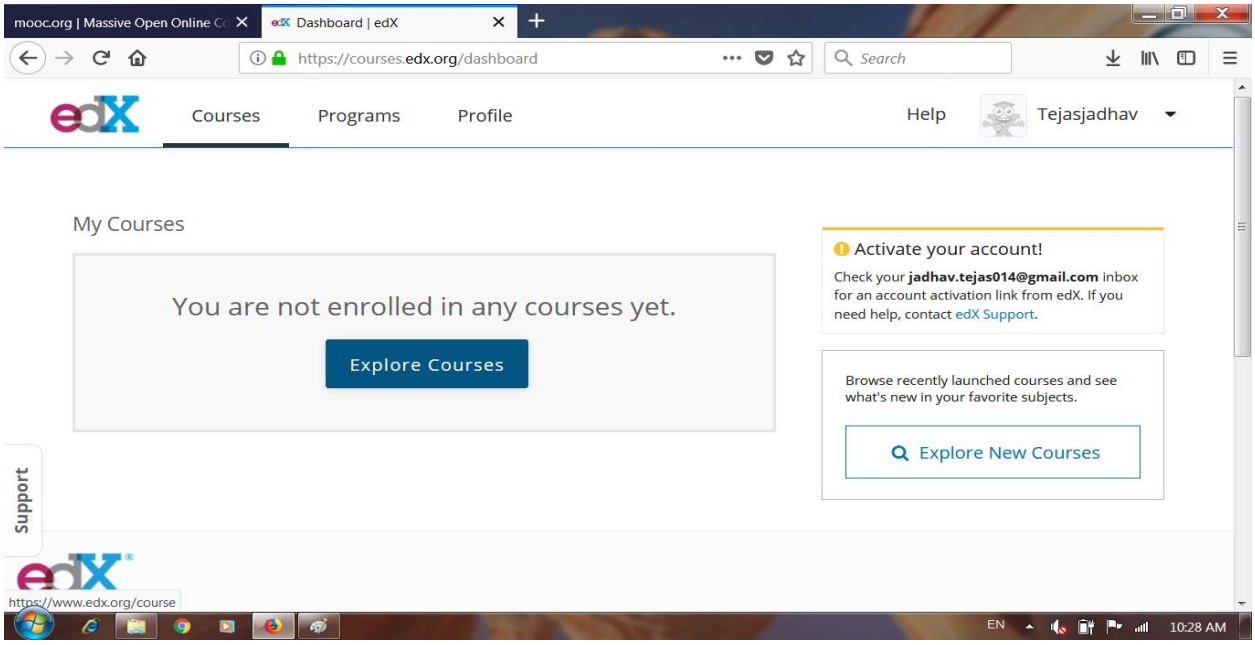



**Step 4** : If we are not register then we have to register with MOOC.Org to apply the courses and Hence our account will create with MOOC courses.

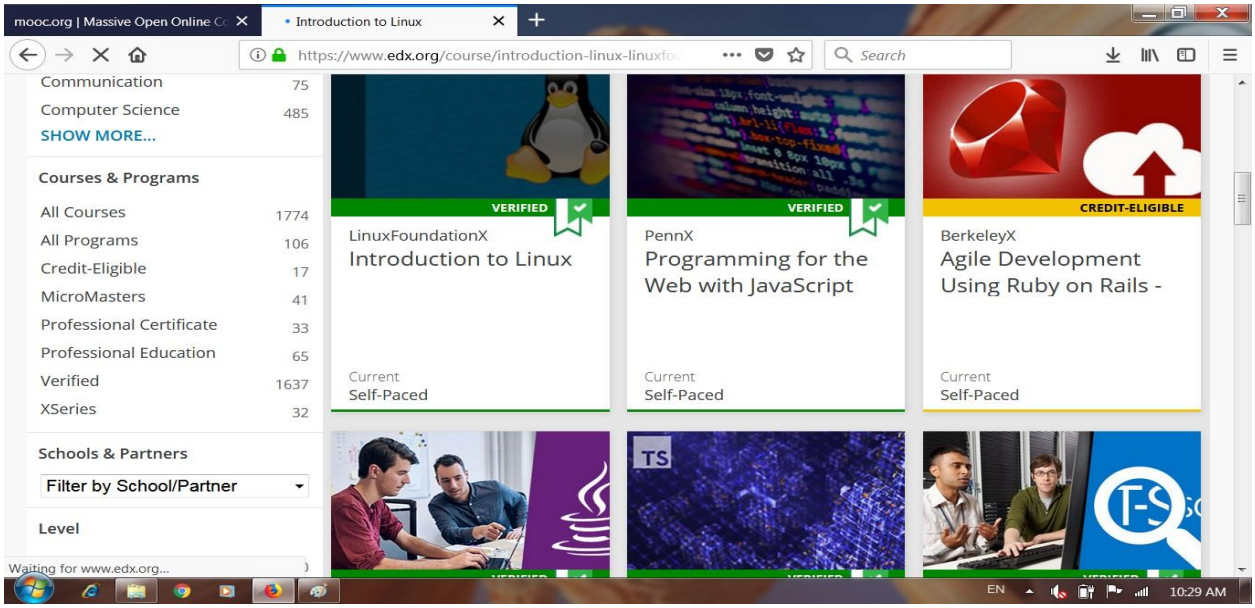


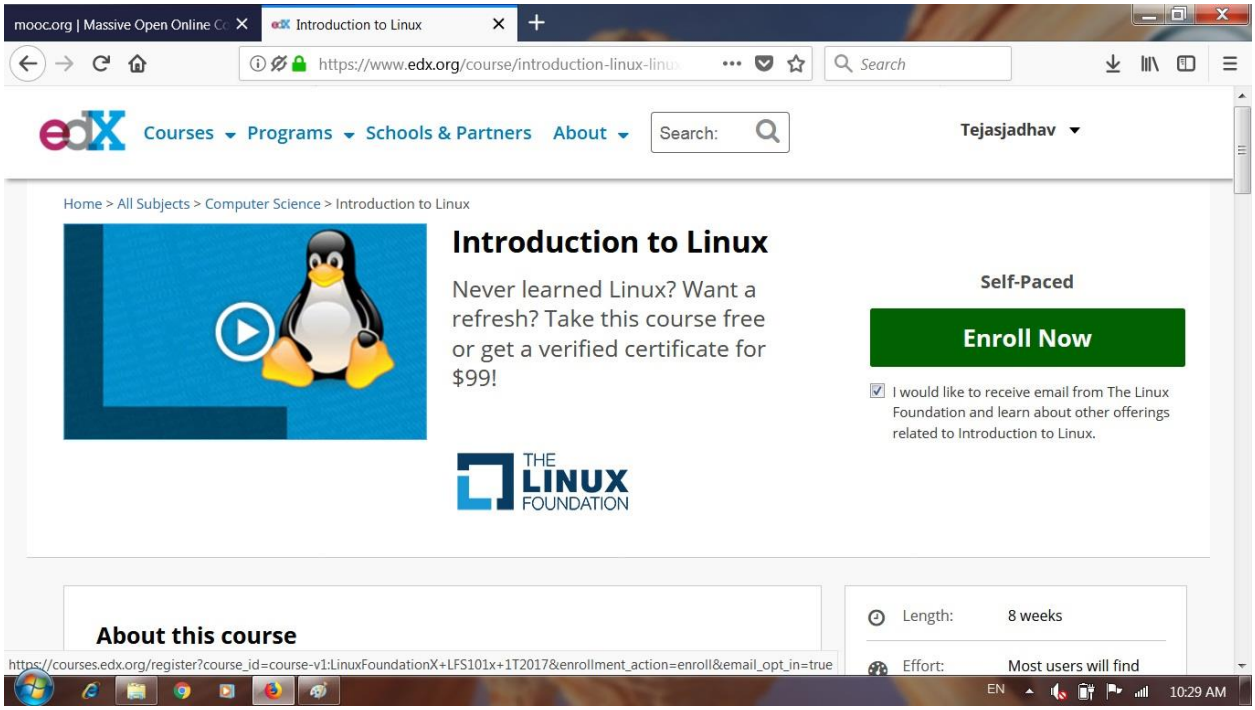



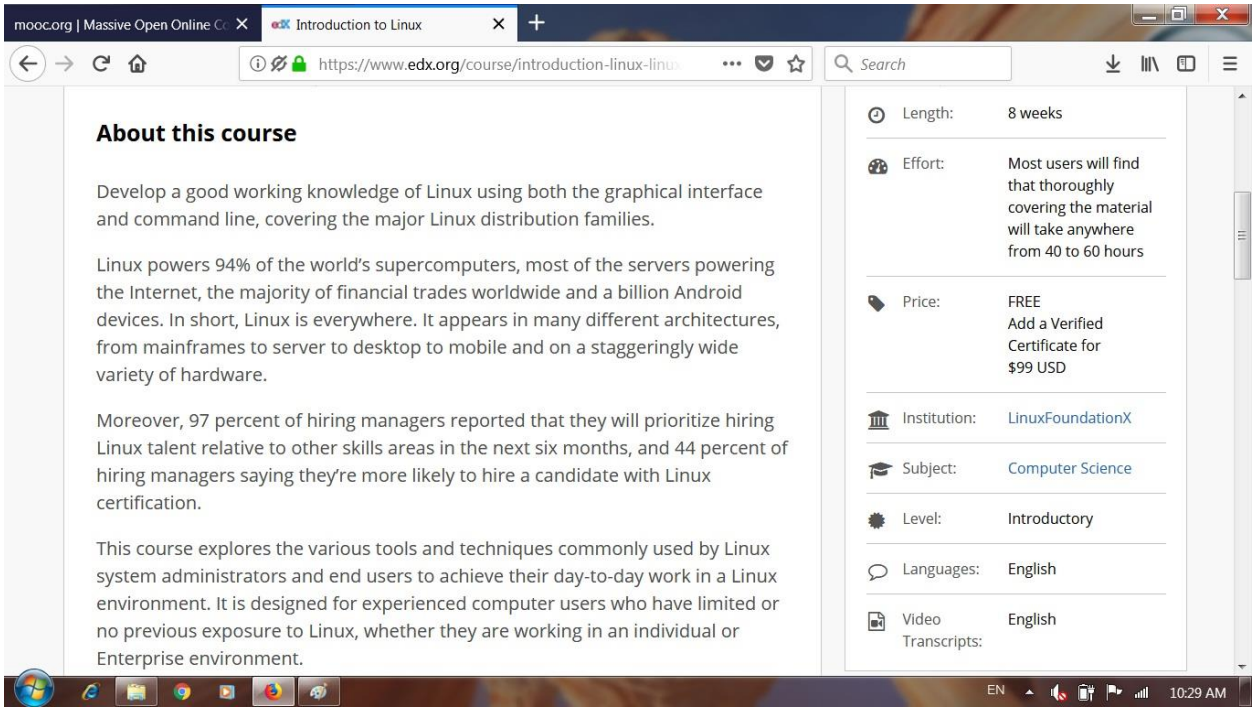

**Step 5** : And then we can apply for the any course.



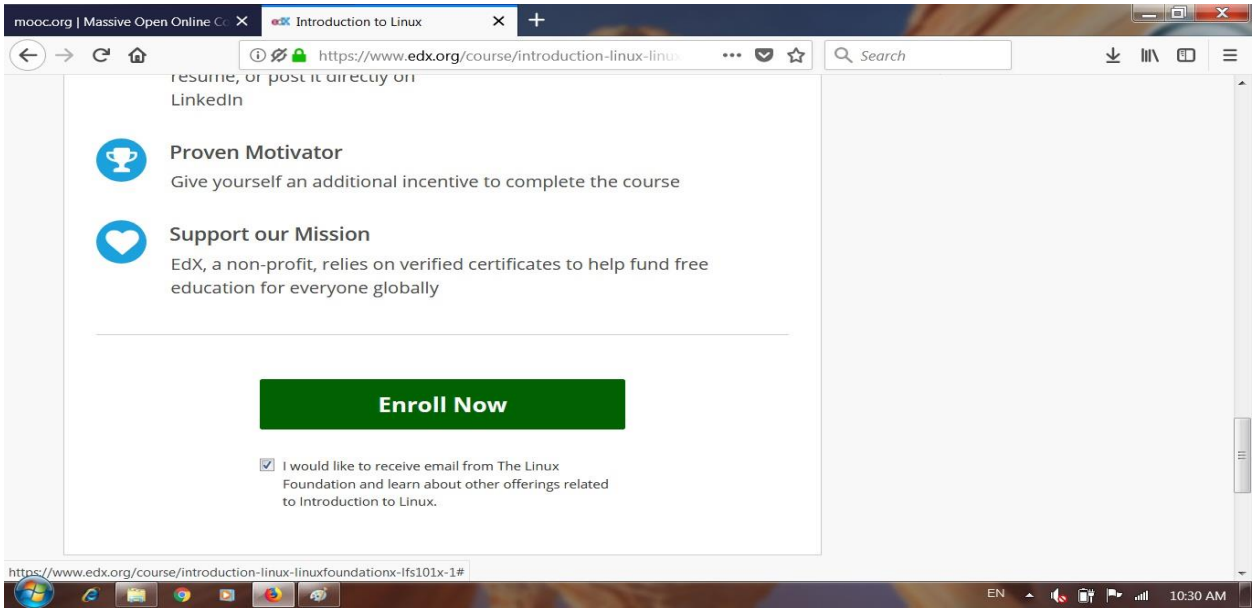

**Step 6** : If we want to see the details about course . we can also do this just select any course it will gives us details of course( given in below picture )





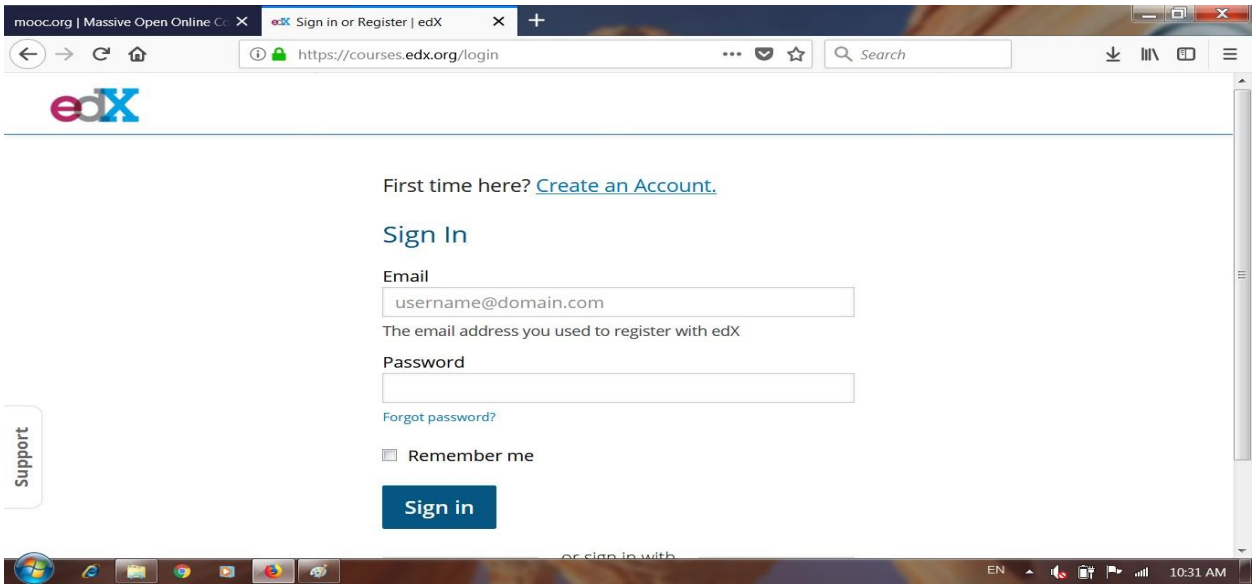




**Step 7** : After do this all things we can apply fo course.




**Step 8** : After enrollment MOOC will provide some online lectures , videos about course and assignment , tutorials we have to complete this all things and we will get online certification of respective course.

**Step 9** : Again you can login , logout to enroll and complete more courses.



## 1.3 CONCLUSION

The timing has never been better for using technology to enable and improve learning at all levels, in all places, and for people of all backgrounds. From the modernization of E-rate to the proliferation and adoption of openly licensed educational resources, the key pieces necessary to realize best the transformations made possible by technology in education are in place.

Educators, policymakers, administrators, and teacher preparation and professional development programs now should embed these tools and resources into their practices. Working in collaboration with families, researchers, cultural institutions, and all other stakeholders, these groups can eliminate inefficiencies, reach beyond the walls of traditional classrooms, and form strong partnerships to support everywhere, all-the-time learning.

Although the presence of technology does not ensure equity and accessibility in learning, it has the power to lower barriers to both in ways previously impossible. No matter their perceived abilities or geographic locations, all learners can access resources, experiences, planning tools, and information that can set them on a path to acquiring expertise unimaginable a generation ago.

All of this can work to augment the knowledge, skills, and competencies of educators. Tools and data systems can be integrated seamlessly to provide information on student learning progress beyond the static and dated scores of traditional assessments. Learning dashboards and collaboration and communication tools can help connect teachers and families with instantaneous ease. This all is made more likely with the guidance of strong vision and leadership at all levels from teacher-leaders to school, district, and state administrators. For these roles, too, technology allows greater communication, resource sharing, and improved practice so that the vision is owned by all and dedicated to helping every individual in the system improve learning for students.

It is a time of great possibility and progress for the use of technology to support learning.

## REFERENCES:


- **www.google.com**
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# DETERMINATION OFACOUSTIC PROPERTIES OF GREEN COCONUT(*COCOS NUCIFERA* L.) WATER AND WHITE MEAT COCONUT WATER FOR 2 MHZ ULTRASONIC FREQUENCY AT TEMPERATURES FROM 15 ºC TO 70 ºC

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## ABSTRACT:

Coconut water and coconut meat is one of the natural food products to quench thirst and refresh the body by providing nutritious content. According to research, the constituents of coconut water are water 94%, sugars such as glucose, fructose and sucrose around 5%, proteins around 0.02% and lipids only about 0.01%. It is rich in minerals such as potassium, calcium, magnesium and manganese, and low in sodium. (Reddy et al, 2014). Due to the global warming the temperature is increasing day by day which can be a factor to change the acoustic properties of coconut water. This paper is devoted to the systematic experimental study of acoustic properties of green coconut water and white meat coconut water using an Ultrasonic interferometer at temperature intervals of 5 °C from 15 °C to 70 °C at constant frequency. The experimental values of Ultrasonic velocity (U) and density (ρ) were used to calculate various acoustical parameters such as adiabatic compressibility ($\beta_{ad}$), intermolecular free length ($L_f$) and acoustic impedance (Z).

**KEY WORDS**: White meat coconut water, green coconut water, acoustic, ultrasonic velocity

## INTRODUCTION:

Due to deterioration of properties once exposed to air, it is thermally processed using ultra high temperature (UHT) technology. The coconut water loses its delicate fresh flavor and some of its nutrients during heating( Reddy et.al., 2014). Thermal treatments result in degradation of color, taste and nutritional value (Matsui et al., 2008). In India coconut water is consumed fresh juice production and meat Coconut is used as one of the cooking ingredient in Kerala, certain areas of Karnataka, Tamil Nadu and Konkan region .The coconut oil do have a worldwide market in health care, skin care, baby oil and cosmetic industries. The study has been carried out to analyze the biochemical profile of coconut water and chemical composition and characteristics. (Renata et al,.2006). Ultrasonic studies of liquid mixtures is reliable tool in the assessment of the nature of molecular interaction within the liquid system. Ultrasonic velocity measurement within the liquid system is used to study the physico-chemical behavior of liquid mixtures. Ultrasonic properties are mainly influenced by temperature, composition and frequency.

## MATERIALS AND METHODS:

The density (ρ) of Green Coconut (C*ocos* Nucifera L.) water and white meat coconut water were determined using volume of water at different temperatures as water is a major component which contributes to change in volume while heating. A constant temperature water bath, made up of double vessel one inside the other. This arrangement provides linear heating. The water is regulated through a motor and temperature is measured using a thermometer immersed in water bath. The Ultrasonic velocity (U) in the Green Coconut (Cocos Nucifera L.) water and white meat coconut water have been measured using an Ultrasonic Fixed-frequency interferometer (Mittal type Model F-05.) at temperature intervals of 5°C from 15°C to 70°C at constant frequency for the measurement of ultrasonic velocity. The liquid understudy is filled in the cell. Ultrasonic wave of known frequency are produced by a quartz crystal fixed at the bottom of the cell. These waves travels through the liquid under study and reflected by a movable metallic plate (plunger) kept parallel to the quartz crystal. The movement of reflector allows the determination of wavelength (λ) of standing wave pattern formed within the liquid. From this measured value of 'λ', ultrasonic velocity 'U' is calculated which is further employed to determine various acoustic parameters in order to study the ultrasonic behavior of liquid.

## THEORY :

The experimental values of density (ρ) and ultrasonic velocity (U) were used to calculate various acoustical parameters such as adiabatic compressibility ($\beta_{ad}$), free length ($L_f$), Acoustical impedance (Z) (Mandlekar, 2014).

$U = n\lambda$ ---------- (1)

$$\beta_{ad} = \frac{1}{\rho U^2} \quad \text{----------} \quad (2)$$

$$L_f = K(\beta_{ad})^{1/2} \quad \text{----------} \quad (3)$$

$Z = U\rho$ ---------- (4)

$K = (91.368+0.3565T)\times10^{-8}$ (Sarvankumar et al 2012) -------- (5)

Where, K – Temperature dependent constant

## RESULTS AND DISCUSSION:

Ultrasonic velocity of sound waves in a medium is fundamentally related to the binding forces between the molecules (Sahu,.2012).

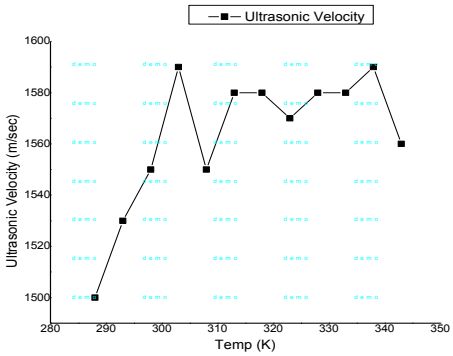


**Figure.1** Plot of ultrasonic velocity vs temperature for Green coconut water.

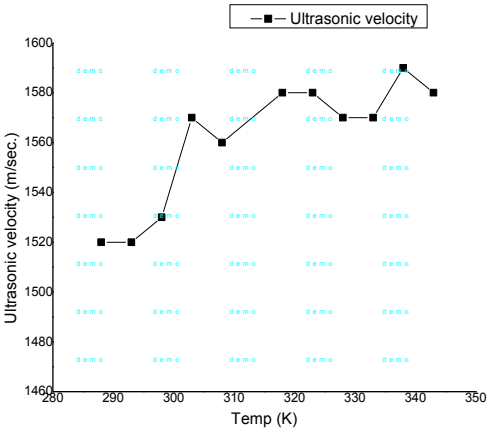


Figure-2 Plot of ultrasonic velocity vs temperature for White meat coconut water.

The variation of ultrasonic velocity with temperature is shown in the Figure1. The ultrasonic velocity slightly increases with the increase of temperature at lower temperature. At 308°K, there is a sudden decrease in velocity followed by slight increment with temperature. The particle, particle interaction increases which can be understood by the rise in velocity. For Green coconut water, with the increase of temperature there is a reduction in density which tends to increase velocity. (figure3) For meat coconut water too, there is a reduction in density with increase of temperature which tends to increase velocity (figure 4).

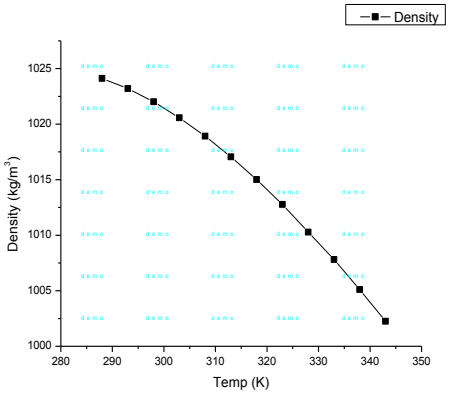


Figure-3 Plot of density vs temperature for Green coconut water.

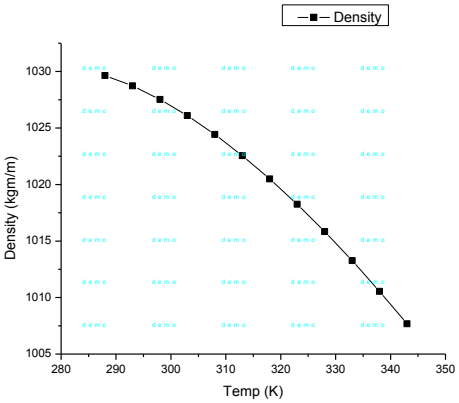


Figure-4 Plot of density vs temperature for White meat coconut water.

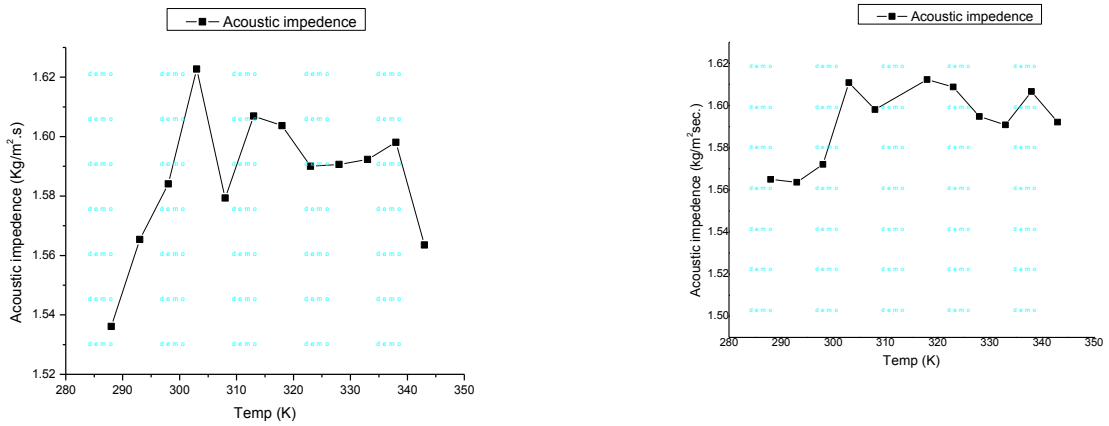


Figure-5 Plot of acoustic impedance vs temperature for A) Green coconut water and B) White meat coconut water.

It is observed that the acoustic impedance (Z) value increases with increase in temperature at lower temperature upto $303^0$K which confirms the presence of molecular association. (Figure 5)

Such increasing trends of impedance further support the possibility of molecular interaction between the components of the liquid. Further increase of temperature shows a reduction in acoustic impedance (Z).

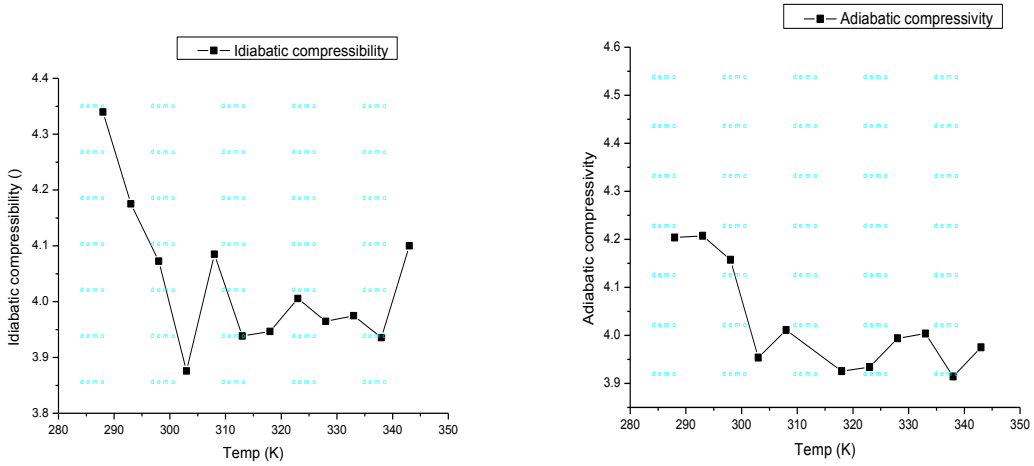


**Figure-6** Plot of adiabatic compressibility vs temperature for A) Green coconut water B) White meat coconut water

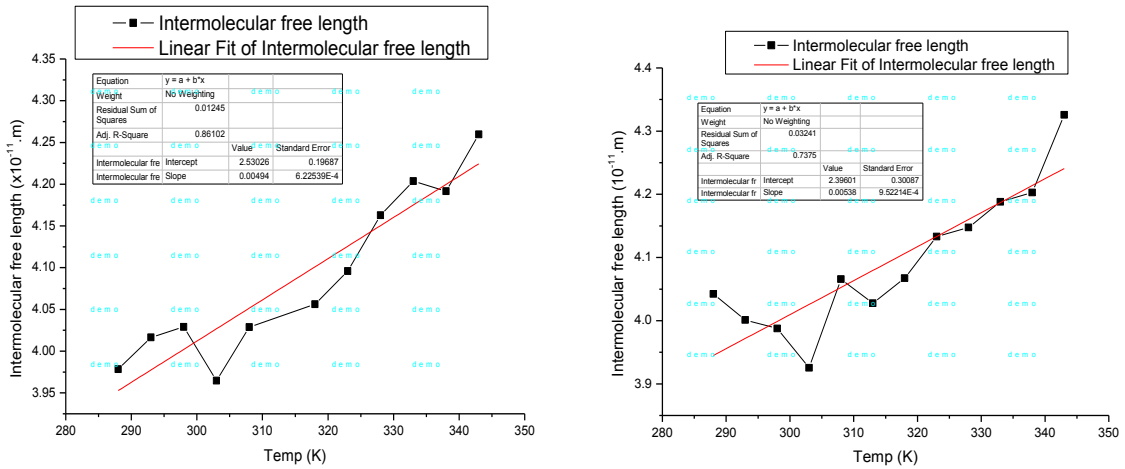


**Figure-7**Plot of Intermolecular free length vs Temperature for Green coconut water B)White meat coconut water.

The decreasing trend of adiabatic compressibility may be because of contraction in volume which leads to subsequent decrease in adiabatic compressibility (Sahu et al.2011).

The same decreasing trend of adiabatic compressibility is also observed in meat coconut water. The variation in the contraction of volume in green coconut water is more compare to white meat coconut water (figure 7). The increase in free length is due to lose packing of the molecules which may be brought by weakening of molecular interactions ( Ezhil Pavai et al,.2011) .

For white meat coconut water, due to weaker molecular interactions, intermolecular free length increases with increase in temperature.

Table .1 For Green coconut water.

| $T^0$ K | ρ Kg/$m^3$ | U m/sec | Z ($10^6 kgm^{-2}s^{-1}$) | $ß_{ad}$ ($10^{-10} m^2 N^{-1}$) | Jacobian constant K $\times 10^{-8}$ | $L_f$ ($10^{-11}$m) |
|---|---|---|---|---|---|---|
| 288 | 1024.1170 | 1500 | 1.5361 | 4.3397 | 194.04 | 4.0422 |
| 293 | 1023.1990 | 1530 | 1.5654 | 4.1750 | 195.82 | 4.0012 |
| 298 | 1022.0108 | 1550 | 1.5841 | 4.0726 | 197.60 | 3.9878 |
| 303 | 1020.5781 | 1590 | 1.6227 | 3.8757 | 199.38 | 3.9253 |
| 308 | 1018.9224 | 1550 | 1.5793 | 4.0850 | 201.17 | 4.0659 |
| 313 | 1017.0607 | 1580 | 1.6069 | 3.9385 | 202.95 | 4.0277 |
| 318 | 1015.0081 | 1580 | 1.6037 | 3.9465 | 204.73 | 4.0672 |
| 323 | 1012.7767 | 1570 | 1.5900 | 4.0057 | 206.51 | 4.1332 |
| 328 | 1010.3770 | 1580 | 1.5906 | 3.9646 | 208.30 | 4.1475 |
| 333 | 1007.8181 | 1580 | 1.5923 | 3.9746 | 210.08 | 4.1882 |
| 338 | 1005.1079 | 1590 | 1.5981 | 3.9354 | 211.86 | 4.2029 |
| 343 | 1002.2529 | 1560 | 1.5635 | 4.0999 | 213.64 | 4.3259 |

Table 2 For meat coconut water

| $T^0$ K | ρ Kg/$m^3$ | U m/sec | Z $(10^6 kgm^{-2}s^{-1})$ | $ß_{ad}$ $(10^{-10} m^2 N^{-1})$ | Jacobian constant K $\times 10^{-8}$ | $L_f$ $(10^{-11} m)$ |
|---|---|---|---|---|---|---|
| 288 | 1029.6495 | 1520 | 1.5650 | 4.2036 | 194.04 | 3.9783 |
| 293 | 1028.7266 | 1520 | 1.5636 | 4.2073 | 195.82 | 4.0166 |
| 298 | 1027.5320 | 1530 | 1.5721 | 4.1573 | 197.60 | 4.0290 |
| 303 | 1026.0915 | 1570 | 1.6109 | 3.9537 | 199.38 | 3.9646 |
| 308 | 1024.4269 | 1560 | 1.5981 | 4.0111 | 201.17 | 4.0289 |
| 313 | 1022.5552 | 1470 | 1.5031 | 4.5256 | 202.95 | 4.3175 |
| 318 | 1020.4914 | 1580 | 1.6123 | 3.9253 | 204.73 | 4.0562 |
| 323 | 1018.2480 | 1580 | 1.6088 | 3.9339 | 206.51 | 4.0960 |
| 328 | 1015.8353 | 1570 | 1.5948 | 3.9937 | 208.30 | 4.1627 |
| 333 | 1013.2625 | 1570 | 1.5908 | 4.0038 | 210.08 | 4.2036 |
| 338 | 1010.5377 | 1590 | 1.6067 | 30914 | 211.86 | 4.1916 |
| 343 | 1007.6674 | 1580 | 1.5921 | 3.9752 | 213.64 | 4.2596 |

## CONCLUSIONS:

The acoustical parameters in the Green coconut water and the white meat coconut water suggests the weak molecular interactions in the molecules of the Green coconut water as well as in the white meat coconut water at different temperatures. Some discrepancy in adiabatic compressibility is observed from 300K to 310 K in both green coconut water and white meat coconut water though in later one it is less. Lesser amplitude of discrepancy might be due to the formation of white meat in the coconut as solidification takes place while the formation of white meat.

## ACKNOWLEDGEMENT:

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# Synthesis and Photoluminescence study of Lithium Aluminium Silicate Host Red Phosphor

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ABSTRACT:

$Li_{(1-x)}AlSiO_4:xEu^{3+}$(x=0.005, 0.01, 0.02) series was synthesised by conventional Solid State Reaction method. The sample was characterised by XRD, EDAX, SEM and photoluminescence.Size of the particles was found to be 2-5 µm. Photoluminescence exhibited Red emission under near-UV excitation.Quencing was observed to be at 1%Europium concentration. Color coordinates was observed in Red region.

**Keywords:** Highlights : Photoluminescence, concentration quenching

## INTRODUCTION

Recently, advances in rare earth (RE)/transition metal ion doped inorganic phosphors, mainly alkali (M) alkaline (N) based ortho-borates with general formula $MNBO_3$[Li P. et al 2009], orthophosphates with general formula $MNPO_4$[Chen Yet al 2010] and alkali based silicates $NaAlSiO_4:Eu^{2+},Ce^{3+}$[Zhoua J. et al 2016] $NaAlSiO_4:Tb^{3+}$[Dhobale S.J et al 2015], $NaAlSiO_4:Dy^{3+}$[Bagga R et al 2013], $NaAlSiO_4:Eu^{2+}$[Jo D S et al 2012] have demonstrated their significance in non-linear optics, optoelectronic devices, dosimetry etc. For the first-time luminescence in $LiAlSiO_4:Mn^{2+}$ is reported in 1974[Laud K R et al 1974]. Since then no luminescence study has been reported for this host. This work isfocussed on Synthesis and photoluminescence study of $Eu^{3+}$ doped $LiAlSiO_4$.

## Experimental

$Li_{(1-x)}AlSiO_4:xEu^{3+}$(x=0.005, 0.01, 0.02) phosphors were synthesised through the traditional solid state reaction process. High purity of $LiCO_3$(99.9%), $Al_2O_3$(99.9%), $SiO_2$(99.9%) and $Sm_2O_3$(99.9%), were used as starting materials. 8 mole % of $H_3BO_3$ was adopted as a flux. Stoichiometrical amount of starting materials and small quantity of ethanol were mixed thoroughly by ball milling for 2 hours. The mixture was first calcined at 800 $^oC$ for four hours in air. The phosphor was allowed to cool naturally, it is grinded and again it is calcined at 900 $^oC$ for four hours in air. The phosphor was allowed to cool slowly to room temperature by natural cooling.

The Crystal structure of the final product was determined by the conventional x-ray diffraction method. (XRD, XPERT PRO, Cu Kα, 40kV). High resolution XRD patterns were collected in the 2θ range from 20 to 120$^o$. Energy dispersive x-ray analysis (EDAX) was done to analyse the chemical components of the phosphor. The morphology and the size of the obtained sample were observed (Scanning Electron microscopy, Quanta 200 with EDS). The excitation and emission spectra were measured. (Hitachi F-7000 fluorescence spectrofluorometer equipped with a 150W Xe lamp). All the experiments were performed at room temperature.

## RESULTS AND DISCUSSION:

### XRD analysis

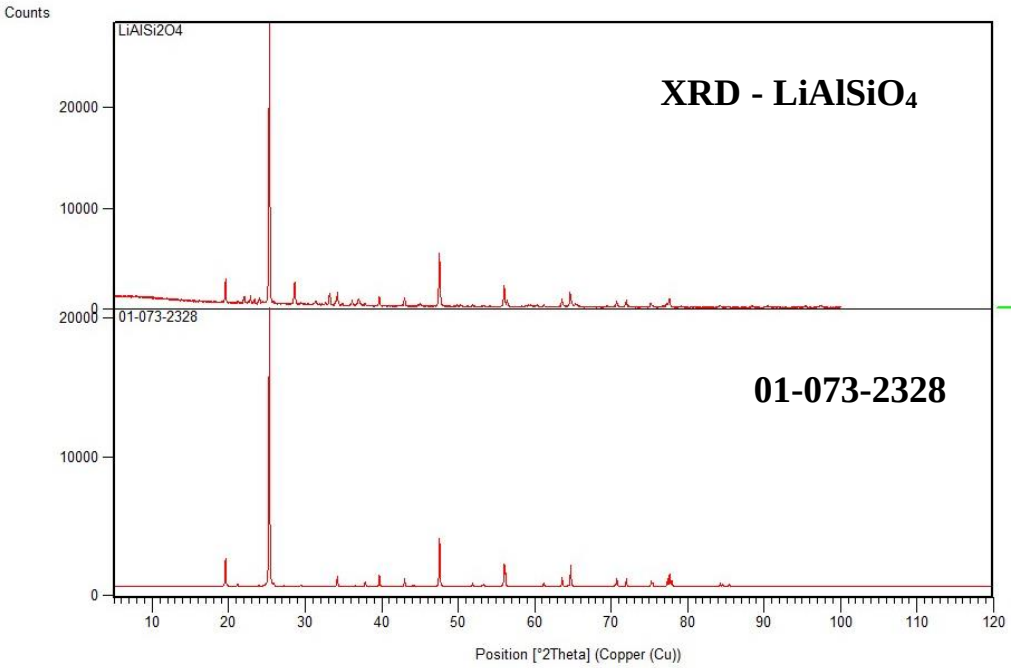


**Figure 1 XRD pattern of $LiAlSiO_4$**

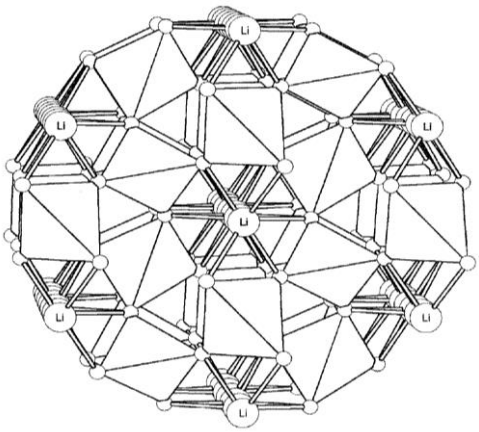

**Figure 2 Schematic view of β - Eucryptite ($LiAlSiO_4$ )**

The exact phase of $LiAlSiO_4$ is indicated by XRD pattern of the sample shown in Figure 1. The XRD pattern agrees well with JCPDS file card number 01-073-2328.The XRD matches with β-$LiAlSiO_4$ (β -eucryptite), which is a low quartz structure[Tscherry V. et.al. 1972]. A corner shared by $AlO_4$ and $SiO_4$ tetrahedral, constructs the framework of β -$LiAlSiO_4$, and the framework constructs a one-dimensional channel which is called a ‘‘quartz channel’’ along the crystal coaxial direction as shown in Figure 2[Guth et. al. 1979]. The $Li^+$ ions alternately occupy the site in the quartz channel. At room temperature, the space group of β-$LiAlSiO_4$ is $D_6^5$ ($P6_422$), and has a low quartz structure[Shin Ichi F. et. al. 2004]. In RE-doped $LiAlSiO_4$ samples, it may be expected that the $RE^{3+}$ ions will replace $Li^+$ (ionic radius = 0.68 A) rather than $Si^{4+}$ (ionic radius = 0.42 A) and $Al^{3+}$ (ionic radius=0.39 A) as the formers ionic radius is closer to the $RE^{3+}$ ionic radius (for $Eu^{3+}$ = 0.954 A). Since both ionic radius and charge are not same for the $Re^{3+}$ and $Li^+$ ions, it is also possible that the dopant ions take an interstitial position in lattice rather than replacing any $Li^+$ ions, where additional peaks will be observed in the XRD pattern. However, in our case, the 1% Eu-doped sample showed similar XRD pattern to that of host XRD reported by JCPDS file card number 01-073-2328. This clearly suggests the fact that RE ions are indeed going to lattice positions rather than interstitial positions. The $RE^{3+}$ ions upon replacing $Li^+$ is bound to create some oxygen-related defect centers or $Li^+$ vacancies for charge compensation. So, it is believed that the dopant ion will be in a structurally disordered environment.

❖ **Morphology is as follows-**

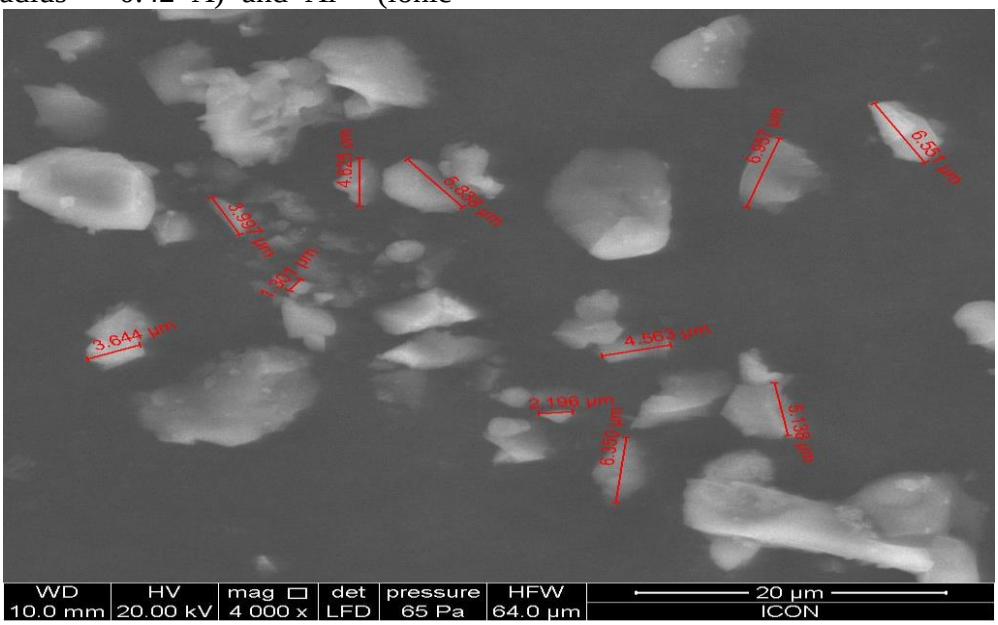


**Figure 3 SEM image of $LiAlSiO_4:Eu^{3+}$**

The morphology of $LiAlSiO_4:Eu^{3+}$ synthesised by solid state reaction is indicated in Figure 3, SEM is observed for as prepared sample without any further process. SEM micrograph indicates the morphology of the phosphor. The size of the particles is observed in the range of 2-10µm. The phosphor exhibited irregular morphology with no uniform shape and size and no obvious agglomeration.

❖ **EDAX Analysis**

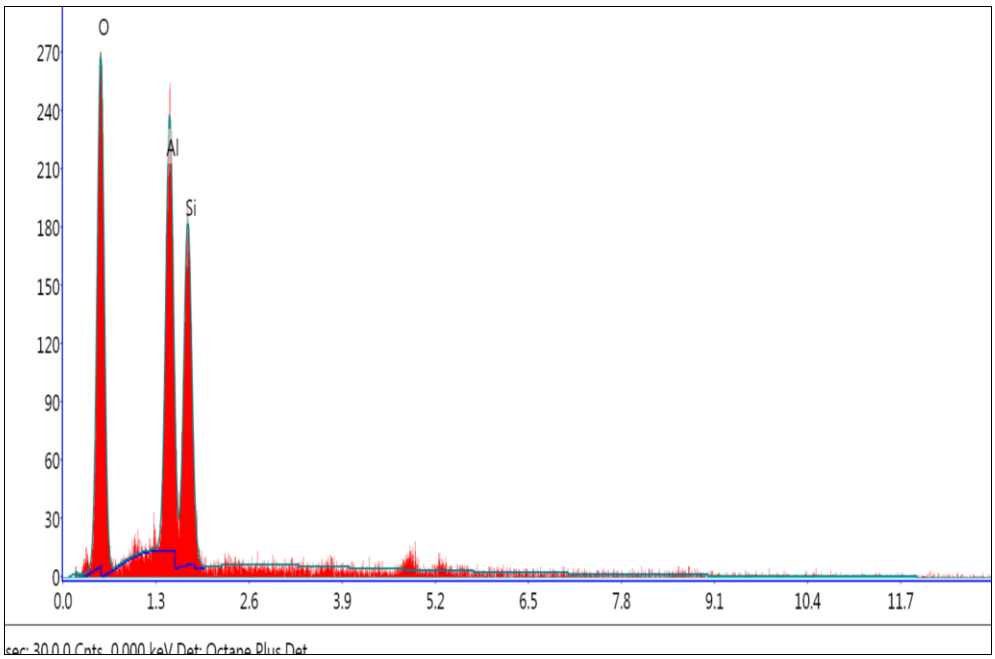


**Figure 4 EDAX image of $LiAlSiO_4:Eu^{3+}$**

❖ **Photoluminescence Excitation (PLE)**

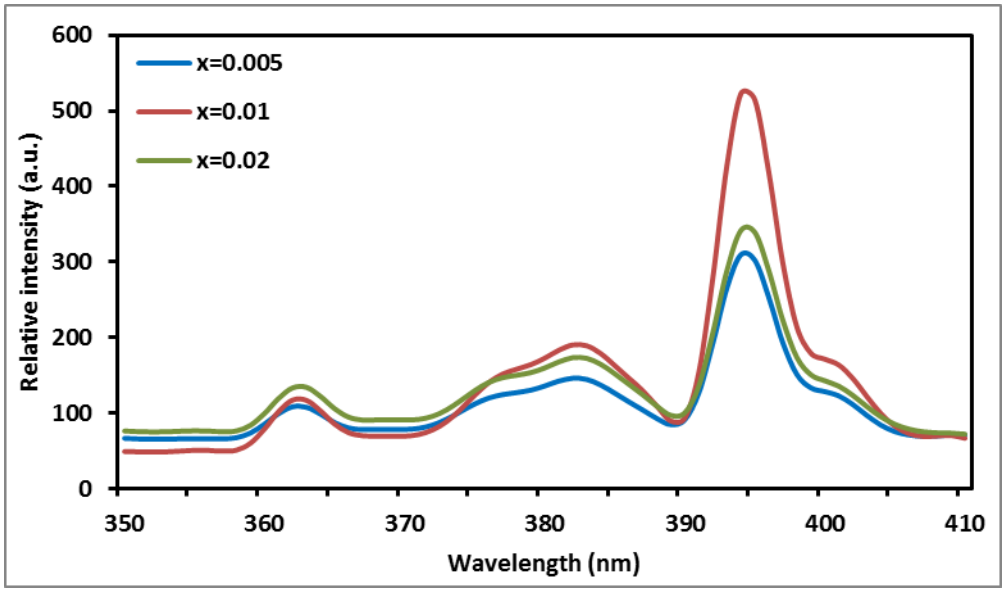


**Figure 5 Excitation spectra of $LiAlSiO_4:Eu^{3+}$ at 615 nm emission**

Figure 4 indicates the EDAX of the as prepared sample. It is observed at magnification of 4000 and for 30 seconds of live period. The peaks in figure shows energy lines Kα(1.486eV) corresponding to Aluminium, Kα(0.523eV) corresponding to oxygen and Kα(1.740eV) corresponding to Silicon atoms. EDAX do not demonstrate Lithium as there are not enough electrons in Lithium atom to disperse the energy. This indicates the chemical composition of the sample $LiAlSiO_4$.

The excitation spectrum of $Eu^{3+}$ doped $LiAlSiO_4$ phosphor while monitoring at 615 nm emission corresponding to the ($^5D_0 \rightarrow {}^7F_2$) transition is presented in Figure 5. In our earlier observations, $Eu^{3+}$ excitation spectrum consists of two parts: one is the broad band from 200 to 350 nm; another is sharp lines from 350 to 410 nm. The intense, broad band with the peak at 260 and 323 nm is assigned to the charge transfer (CT) band of $Eu^{3+} \rightarrow O^{2-}$ and host, respectively. The broad bands in the UV region may contain the charge transfer excitation of $Eu^{3+}$ ions and the energy transfer transition from silicate groups to $Eu^{3+}$ ions. In most of the literature, the contribution of the two components cannot be distinguished due to spectral overlap[Saradhi M P et al 2006]. The CT band corresponds to the electronic transition from the 2p orbital of $O^{2-}$ to the 4f orbital of Eu3+, and it is related closely to the covalence between $O^{2-}$ and $Eu^{3+}$ and coordination environment around $Eu^{3+}$. The decrease in energy for electron transfersin $O^{2-}$ to $Eu^{3+}$represents the increase in the covalence and the decrease in ionicity between oxygen and $Eu^{3+}$. In this it is observed that excitation is at 615nm in the range of 350 to 410nm. A series of sharp excitation bands present between 350 and 410 nm that are associated with the typical intra-4f transitions of the $Eu^{3+}$ ions that centered at 362, 382 attributed to $^7F_0 \rightarrow {}^5D_4$ and 394 nm was attributed to the, $^7F_0 \rightarrow {}^5L_7$ transitions. The strongest excitation peaks at 394 nm contribute to the $^7F_0 \rightarrow {}^5L_7$ transition in the UV light region, so the $LiAlSiO_4$:$x$$Eu^{3+}$ phosphor is thus suitable to be used for near-UV exciting red phosphor for white light emitting devices.

❖ **Photoluminescence Emission (PL)**

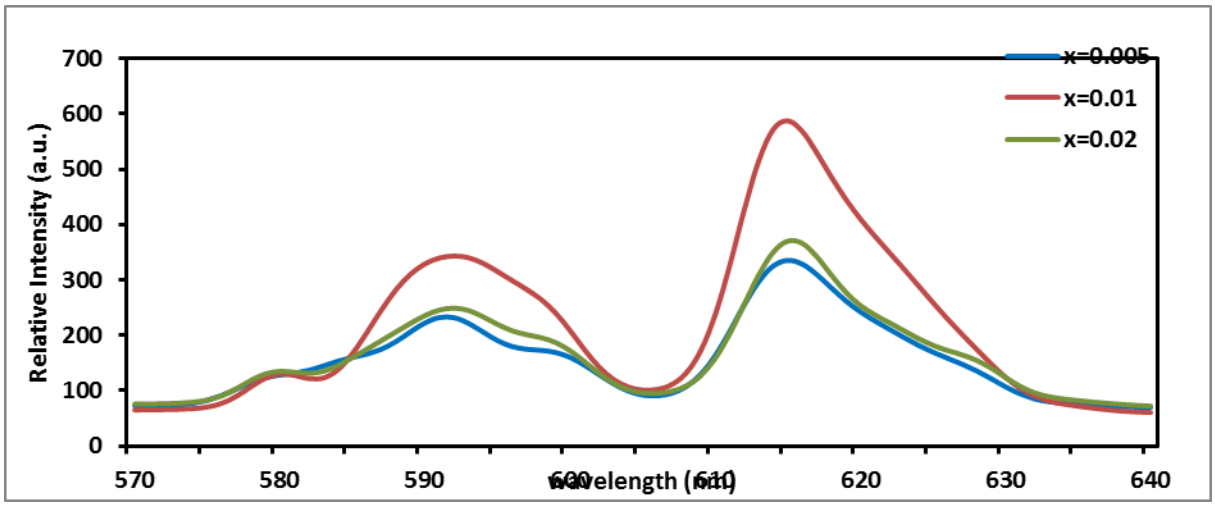


**Figure 6: Emission spectra of $LiAlSiO_4$:$Eu^{3+}$ at 394nm excitation**

Figure 6exhibits the emission spectrum of $Eu^{3+}$ doped $LiAlSiO_4$ phosphor excited under 394 nm near UV light. It is observed that the emission spectra consisting of lines in the orange and red spectral range exhibit exclusively the characteristic f-f transitions of $Eu^{3+}$, namely, $^5D_0 \rightarrow {}^7F_1$(592 nm) and $^5D_0 \rightarrow {}^7F_2$(615 nm), respectively. The transition $^5D_0 \rightarrow {}^7F_1$ satisfies the selection rule of $\Delta J = \pm 1$ where J is the angular momentum. Magnetic dipole transition obeys the selection rule of $\Delta J=0$ and $\pm 1$ and electric dipole transitions only obey the selection rule of $\Delta J' \leq 6$ where J or J'=0 when $\Delta J=2, 3, 6$[Xu X. H. et. al. 2011]. From Figure 6, it is observed that the emission spectrum not only has the intense red peaks at 615 nm due to the electric dipole transition $^5D_0 \rightarrow {}^7F_2$, but also has other powerful peak in the range of 570–700 nm, of which involve available peaks at 592 nm ascribed to the magnetic dipole transitions, as an internal standard to gain some idea as to the relative transition strengths of the other transitions of $Eu^{3+}$[Dhanaraj J et al 2001].

The doping concentration of luminescent centers is an important factor influencing the phosphor performance. Therefore, it is necessary to confirm the optimum doping concentration. The emission spectra of $Li_{(1-x)}AlSiO_4:xEu^{3+}$ phosphors with different $Eu^{3+}$ concentrations under 394 nm excitation are shown in Fig. The intensity of all of the emission are enhanced significantly with the $Eu^{3+}$ concentration increasing from 0.005 to 0.01, and then decreases for the doping concentration higher than $x$= 0.01. That was because of an indication of nonradiative energy transfer between $Eu^{3+}$ ions. This may occur owing to exchange interaction, radiation reabsorption, or multipole- multipole interaction. In the present case, radiation reabsorption due to spectral overlap alone cannot be fully responsible for nonradiative energy transfer among the $Eu^{3+}$ ions. Hence, the process of energy transfer should be electric multipole-multipole interaction. The probability of energy transfer between the $Eu^{3+}$ ions is distance-dependent, as the concentration of $Eu^{3+}$ions increases to some extent, the distance between the $Eu^{3+}$ ions becomes smaller, and mutual action between the $Eu^{3+}$ ions increases the loss of energy[Tian Y. 2009]. So, the $Eu^{3+}$ ions concentration is the main factor to influence the emission peak intensity. The concentration quenching is due to energy transfer from one activator (donor) to another until the energy sink (acceptor) in the lattice is reached. Hence, the energy transfer will strongly depend on the distance ($R$c) between the $Eu^{3+}$ ions, which can be obtained using the following equation[Blasse G. et. al. 1994].

$$R_C \approx 2\left[\frac{3V}{4\pi X_C Z}\right]^{1/3} \text{---------- (1)}$$

Where $X$c is the critical concentration, $Z$ is the number of tri-valence of rare-earth ions in the $LiAlSiO_4$ unit cell [$Z$=12 in $LiAlSiO_4$], and $V$ is the volume of the unit cell ($V$=1.065nm3 in this case). The critical concentration is estimated to be about $x$=0.01, where the measured emission intensity begins to decrease. The critical distance ($R$c) between the donor and acceptor can be calculated from the critical concentration, for which the nonradiative transfer rate equals the internal decay rate (radiative

rate). Blasse assumed that, for the critical concentration, the average shortest distance between the nearest activator ions is equal to the critical distance. By taking the experimental and analytic values of *V*, *Z* and *X*c (1.065nm3, 12, 0.01, respectively), the critical distance *R*c is estimated by Eq. (1) to be about 2.569nm. Since Rc is not less than 0.5 nm exchange interaction is not responsible for non-radiative energy transfer process from one $Eu^{3+}$ ion to another $Eu^{3+}$ ion. The mechanism of radiation reabsorption is the primary method only if the fluorescence spectra of the excitation and emission have obvious overlap. Thus, in view of the emission and excitation spectra of $LiAlSiO_4:Eu^{3+}$, the radiation reabsorption is unlikely to occur. As a result, the energy transfer process of $Eu^{3+}$ in $LiAlSiO_4$ phosphor would be due to multipolar interaction. Further it can be proved to be due to quadrupole-quadrupole interaction.

❖ **CIE 1931 Color Coordinates**

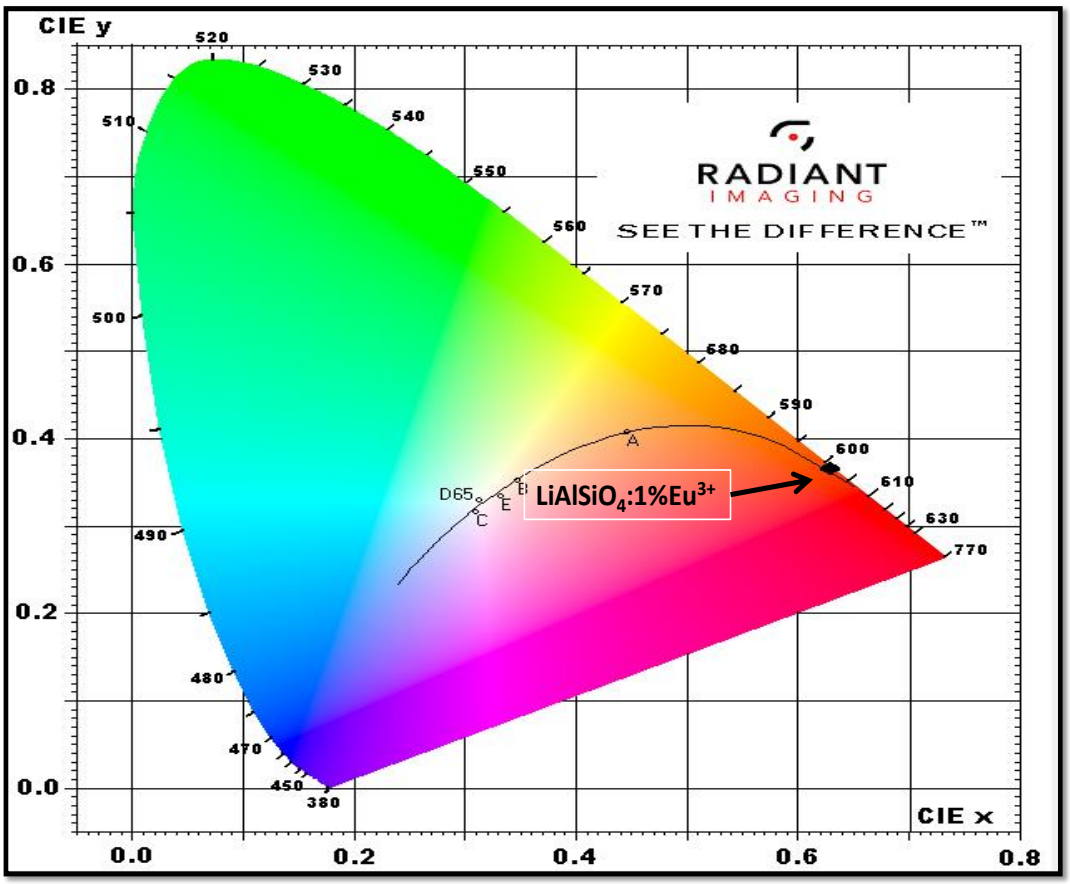


**Figure 7 CIE color-coordinates of the $Li_{0.99}AlSiO_4:0.01Eu^{3+}$ phosphor**

The Commission International de'Eclairage (CIE) chromaticity coordination of the $Li_{0.99}AlSiO_4:0.01Eu^{3+}$phosphor is shown in Figure 7.The chromaticity coordinates of $Li_{0.99}AlSiO_4:0.01Eu^{3+}$ phosphors are x=0.629 and y=0.366 which corresponds to red emission.

## CONCLUSION :

The $LiAlSiO_4:Eu^{3+}$ phosphor was successfully synthesized by conventional solid-state reactionmethod at 900°C. The particle size of the phosphorwas found to be in the range of 2–10 µm. The chemicalcomposition is verified by EDAX analysis. PL study indicatesthat the phosphor exhibits 592nm ($^5D_0 \rightarrow {}^7F_1$) and 615nm ($^5D_0 \rightarrow {}^7F_2$)wavelengths at 394nm excitation wavelength. The CIE color coordinates are x=0.629 and y=0.366 for 1% doping concentrationof $Eu^{3+}$,which are very close to standard NTSC color-coordinates for Red. As $LiAlSiO_4:Eu^{3+}$ phosphor, when excited in near-UV region, emits visible Red,it means the $LiAlSiO_4:Eu^{3+}$ phosphor has extensive application in solid state lighting. It is hence suggested that $LiAlSiO_4:Eu^{3+}$ could be a good candidate for phosphor converted-Red LEDs.

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# POVERTY IN URBAN INDIA

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**ABSTRACT:**

Living in urban era where most of the world's economy and more than half of its population are now soaring to their dreams in urban areas. Urban areas have always been a platform for most of the people where their hard work seems to decrease the poverty in their life. Urban areas are always a source for an ample job opportunity hub which attracts most of the destitute families. But no one looked at the other scenario, that poverty exist in urban areas too, which in modern term is known as urban poverty. This research paper focused on the causes of poverty in urban areas, its impact on urban socio economic scenario. This research paper also attempts to give suggestions to eradicate or rather lessen urban poverty.

***Keyword: urban poverty, Five Year plan, government schemes.***

## INTRODUCTION

Poverty means scarcity of resources in terms of money and other kinds to meet the daily requirements. It is the sum total of problems and hurdles in living a normal life such as paucity of money for fuel, housing, health, medicine, education, festival celebration or any of the above mentioned.

McDonald & McMillen, 2008; defined urban poverty in two ways: as an absolute standard based on a minimum amount of income needed to sustain a healthy and minimally comfortable life, and as a relative standard that is set based on average the standard of living in a nation.

Each five year plan focuses on particular areas development target. The first plan of Indian government regarding poverty has been a part of the debate with the primary focus being on agriculture and rural development. Urban poverty was not recognised as a concern in the initial plan period. The shift of concern towards urban era was from 1985 to 1990 that is from 7$^{th}$ five year plan period. This gives attention towards environment improvement, slum up gradation, infrastructure and livelihood promotion.

The first five year plan focused on poverty alleviation by improving agricultural production. Second and third five year plan focused on investment for employment generation in public sectors. The unclear picture of the scale and depth of poverty has always made making these policies ineffective. Hence, the present article focused on Poverty which still persists in some parts of urban India.

**Source Areas:** Poverty in Mumbai city selected as a case study with the following points-

1. Settlement along the pipelines of the internal express roads in Govandi - Mankhurd.
2. Settlement near the creek of Bandra - Kurla - Mahim
3. Slums in the sub urban in Mumbai such as Kandivali, Wadala and cotton green
4. Prostitute red light areas slums of Mumbai Central, slums besides the railway tracks.
5. Slums, the shanties on the footpath for example. Reay road, dockyard, small lanes towards Bhaucha Dhakka Port etc.

## METHODOLOGY:

Personal visited to these above discussed areas in Mumbai city for the purpose of this research paper.

## Observations:

There are various symptoms to be considered in a particular area as a poverty prone area in Mumbai. The symptoms observed in these houses are shabby and poor structural appearance, plastic canvas, broken tins with multiple patches, concrete debris on floor in huts and shanties. These residential do not fulfil the concept of a house. These residential areas near the creek and away from the creeks are habitually habitat by the burrowing animals like rat and goose. The contaminated creek water and the waste water from sewage (*Nalas*) directly enter into the houses and are primary affecting the health in these areas. Many shanties are erected on top of the gutters and between the two pipelines supplying water.

The standard of living is below minimum standard observed in the entire red light areas such as Sonapur in Bhandup and the Grant Road in Mumbai experiences the above-mentioned symptoms.(To be noted, in some cases the condition may exclude as an exceptional due to specific resons). The causes of poverty is as follows –

**Causes:**

1. **Unemployment:** Population not involved in all spheres of employment due to Lethargic attitude related to work. No assured employment due to casual/daily employment contract labour for eight hours.
2. **Cultural habits:** Religious culture of family may not permit children for minimum education as a result they are deprived of multiple available easy jobs which requires no skills at all.
3. **Corruption:** Due to economically poor conditions, the people here are ready to commit crime for money. Also slums become hub of drug addicted victims and safe heaven for anti-elements and minor-major criminals.
4. **Migrations**: Adding population from different parts of the country will lead to adding to the existing number of shanties, thus extending deep into the creeks such as Mankhurd, Govandi, Bandra, Mahim and creeks of Airoli - Mulund.
5. **Political cause**: Due to poor conditions of the migrators the local politician may take undue advantage of this situation.
6. **Government Role:** The enormous challenges daily life in slums, it is necessary to enquire plan and action by the government. This problem may be

due to less awareness or not reached government plans, failure of economy, and lack of equity in the provision of services, unaffordable means of infrastructure and mobility facilities.

**Impact on Urban-Economic Scenario.**

The location of urban poverty areas prevents the Multi-National companies from setting up their branches or offices even in the prime locations of the cities. The fear of losing clients and businesses in this location is also an impact. The poor locations takes lead to slow speed of residential developments. The new developmental projects of the government such as metro, mono-rail, connecting link bridges within the cities have become tough and difficult due to the problems involved, related to this poverty areas such as rehabilitation problems and compensation problem.

The extension and development of existing airports and creation of new airports and helipads, which is the prime need of the hour of the city is not fulfilled due to the problems of urban poverty area.

The urban poverty areas are concentrated by high population affected by tuberculosis, HIV, Sexually Transmitted Disease affected. The residing of huge number of third gender population in these areas also prevents the economic growth of the part of cities, such as *Vikhroli in Mumbai.*

The encroachments on footpaths and open spaces, on public grounds, below the SATIS (Station Area Transport Improvement Scheme) and other unauthorised constructions, have hampered the beauty of the city.

Taking into consideration the above impacts these areas acts as stumbling blocks and hurdles in the economic growth of the respective city. Due to this, the inflow of capital investment from foreign investors into the Indian urban areas gets restricted. The ratio of foreign tourist coming into cities also gets reduced. This scenario spoils the image of the city and the country in the foreign countries when photograph of urban poverty areas are put into exhibition.

**Ways to Eradicate Urban Poverty.**

1. Implementing the government welfare schemes for re-habilitation.

For example, The 'National Urban Housing & Habitat Policy 2007' (NUHHP-2007) has been formulated keeping in view the changing socio-economic parameters of the urban areas and growing requirement of shelter and related infrastructure. The policy seeks to promote various types of public-private partnerships for realizing the goal of "Affordable Housing for All" with special emphasis on the urban poor.

2. Implementing the government education development schemes like 'Sarva Shiksha Abhiyan', 'Incentives to Girls at Secondary Stage', 'Rashtriya Madhyamik Shiksha Abhiyan' (RMSA) .
3. Employment schemes like 'Prime Minister's Employment Generation Programme'. The scheme was announced by the Prime Minister on 15 August, 2008 in his address from Red Fort. Its main aim is to generate

continuous and sustainable employment opportunities in rural and urban areas of the country.

4. Developing the sanitation facilities, cleanliness and construction of sufficient public toilets.
5. Developing better and sufficient public bathrooms.
6. Increasing the task force for law and order enforcing team in these areas. Raiding the centre of active criminal locations located in these areas.
7. Making films in Bollywood related to the problem of urban poverty areas, will help in creating awareness in the society.

## CONCLUSION

The entire city constitutes to the personality of city. Neglecting the developmental aspects of the urban poverty area will lead to the creation of dark patches of criminalization in the cities. Therefore, utilising the entire government machinery at social, political and administrative level will definitely help to solve the problem of urban poverty area. It will create an ample space for urban housing, urban accommodation, and urban tolerance and will add to the growth of municipal taxes. This will increase the treasury funds of the municipalities. It will help to change the face of the cities from better to best and will help in improving the image of the city. Sincere social awareness will definitely play a pivotal role in the above issue.

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# RAILWAY GATE CONTROL SYSTEM USING ATMEGA8

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## ABSTRACT:

This work is on railway gate at a level crossing replacing the gates operated by the gatekeeper. The system reduces the time for which the gate remains closed. This type of gates can be employed in an unmanned level crossing where, the operation is automatic and error due to manual operation is prevented. The system works on a microcontroller based control. The system uses AVR ATmega8 microcontroller with the IR sensors .The arrival and leaving of the system is monitored and the gate is operated accordingly.

**KEYWORDS**: ATmega8, IR sensors,L293D.

## INTRODUCTION:

Railway Gate control system using AVR micro controller gates will close automatically when train arrival and open when train departure from crossing. Manual operation of gates introduces errors and time delay which may cause to Sever disadvantages or sometimes accidents. Automation reduces the time and effort. Also it provides the accuracy. Atmel Ic's are cost effective and readily available in most places. We can interface it with many sensors at same time. Also with the help of

I2C we can increase the efficiency. The main purpose is to avoid accidents and save time. This model utilizes two IR Tx./Rx pair is placed at either side of the gate with some distance.

## MATERIAL AND METHODS:

**Hardware:**

The components used are as follows.

**Microcontroller:**

Features: Atmega8 Ic is 8 bit AVR. It is high performance low power microcontroller. It has advance RICS architecture with 130 powerful instructions. There are 328 bit general purpose registers which are fully static operated with throughput at 16MHz.Atmega 8 has high endurance non-volatile memory segments with 8K bytes of in-system self-programming flash program memory,512 bytes EEPROM and 1Kbyte internal SRAM. It provides programming lock for software security. The peripheral features include two 8-bit Timer/Counters with Separate Prescaler, one Compare Mode and one 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture mode. It has real time Counter with Separate Oscillator, three PWM Channels and 6-channel ADC in PDIP package. Interfacing can be done by two-wire serial, UART, master/slave SPI serial interface and watchdog timer with separate on-chip oscillator. There are external and internal interrupt sources. It has five sleep modes which includes Idle, ADC

noise reduction, power-save, power-down and standby. There are 23 programmable I/O lines. The operating voltage is 4.5V to 5.5V, speed grade is 0-16 MHz. Power consumption at 4MHz, 3V, 25° C is 3.6 mA for active mode, 1.0 mA for Idle mode and 0.5µA for power down mode.(Atmega8, 2013)

IR Sensor :( IR range Frequency -$3x10^{11}$Hz to $3.9x10^{14}$Hz) an infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that it is detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light receiver.

IC L293D:L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As the voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction. Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two H-Bridge circuit inside the IC which can rotate two dc motor independently. (Kushaghra 2012)

Buzzer and light signal and seven segment display: They are used to warn the road user about the approach of train. Power Supply used are 5 volt dc for IC and 12 volts to motor.

Software: The software part is done as follows.

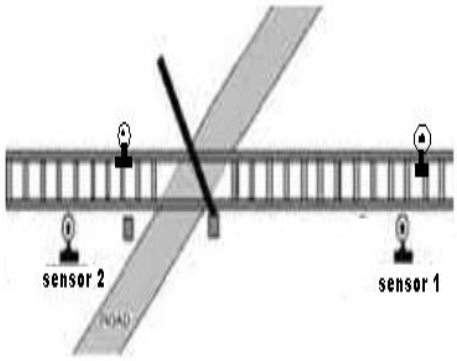
The program is written in embedded C [Muhammad Ali Mazidi 2013] .The program written is converted into hex file using Atmel Studio 6.0software. This hex file is written into IC AVR ATmega8 by the process called burning through development software called USB asp-IC Programmer for 89s51.

## RESULTS AND DISCUSSION:

**Working:**

The two IR sensors are placed at left and right of the railway gate. The distance depends on the length and speed of the train which can be adjusted through the program.

Initially the gate is open the signal was green light which vehicles can make movement on road across the railway tracks as in figure 1.



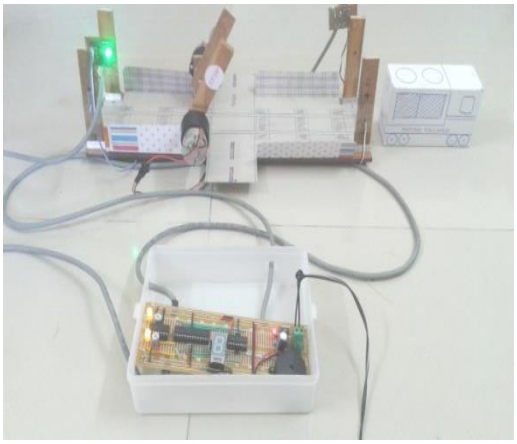
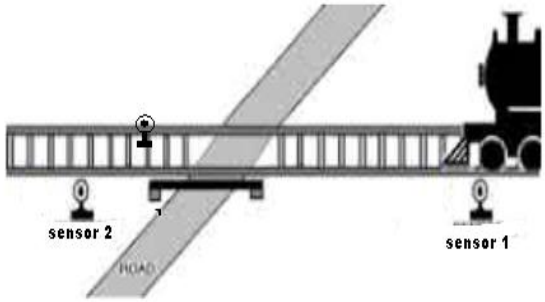


Figure 1 Opened Gates.

As soon as the first sensor detects the arrival of the train, the countdown begins and the buzzer is activated. After the count zero the signal toggles from green to red and the gate is closed as shown in figure 2.



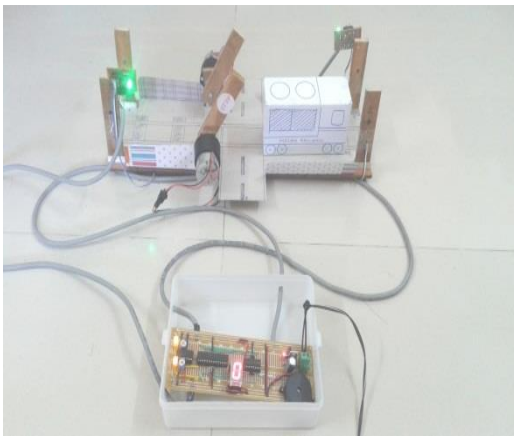



Figure 2: Train crossed first sensor.
The gate remains closed as the train passes through the crossing as in figure 3.

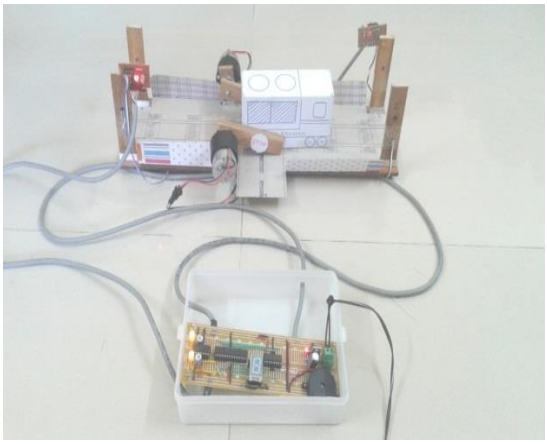
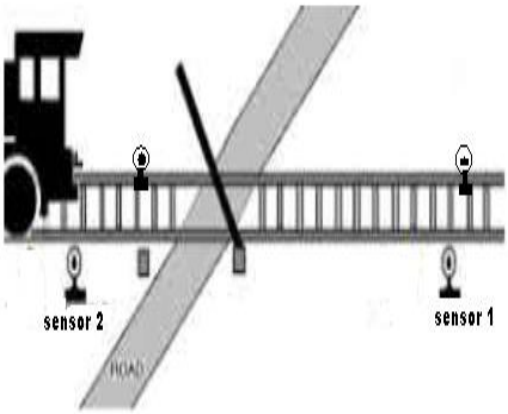


Figure 3 Closed Gates.

When the train reaches the second sensor the buzzer is activated and as soon as train passes through sensor the gate is opened as in figure 4.



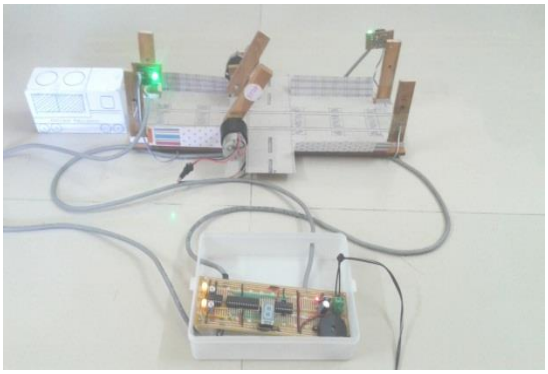



Figure 4: Train crossed second Sensor.

**Discussion:**

The IR sensors sense the input and sends to the microcontroller, where it responds and gives command to the particular component with predefined programming. The timing condition for the railway gate control system must be set based on the speed and length of the train into the program which can be easily changed and modified using microcontroller. The DC motor is controlled by the microcontroller for rotations of the gate. This system, a scaled down model attempts to mimic the real time railway gate control. Employing the automatic railway gate control system at the level crossing may offer several advantages for public. Since, the operation is automatic, error due to manual operation is prevented.

## ACKNOWLEDGEMENT:

Authors are thankful to VPM's B. N. Bandodkar College of Science Thane and Physics Department.

## CONCLUSION:

The working model of railway gate was designed and proposed. It worked as unidirectional railway gate. The implementation of this model was very easy. Human intervention at level crossing if removed and many railway level crossing accidents may be prevented. It reduces the time for which the gate is being kept closed.

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# SYNTHESIS AND CHARACTERIZATION OFCALCIUM FERRITE NANOPARTICLES

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## ABSTRACT

The calcium ferrite [$CaFe_2O_4$] spinel compound was synthesized by co-precipitation route from $Ca^{2+}$/$Fe^{3+}$ in aqueous solutions (molar ratio 1:1) by adding base under mechanical stirring. The synthesized nano-particles are subjected for calcination at two different temperature 600°C and 800°C for 8hrs.The synthesizedCalcium Ferrite nanoparticles by using Ferric Nitrate [$Fe(NO_3)_3$] and Calcium Nitrate[$Ca(NO_3)_2$] at 70°C and calcined at 800°C for 8hrs are found to be in better yield. The characterization of the material was done with IR spectroscopy.

## INTRODUCTION

Spinel ferrites with a general formula ($AB_2O_4$) are a class of chemically and thermally stable material. Recently the magnetic nanoparticles of spinel ferrite were focused by many researchers because of their interesting electrical and magnetic properties (L Satyanarayana et al 1998).The behaviour of ferrite compounds depends on the method of preparation, purity,magnetic properties etc. Ferrites are iron containing complex oxides with interesting magnetic properties **(**S.Rana et al 2010**).** Numerous and diverse methodologies exist to synthesize magnetic nanoparticles of magnetite in order to obtain different shapes and sizes.Ferrites are divided into three families: spinels, hexagonal ferrites and garnets (R.M.Silverstein et al 2005). Calcium ferrite has an extensive scientific and technological applications in the optical memory devices, magnetoplumbite structure & steel making industries **(**S.Rana et al 2010**).**

## Experimental

**Material:** All the reagents and compounds were used as received without +purification. Ferric Nitrate [$Fe(NO_3)_3$] and Calcium Nitrate [$Ca(NO_3)_2$] werepurchased from Loba chemicals (AR-Grade) was used in all the preparation.

**Methods:** There are various methods used for the synthesis of Calcium ferrite nanoparticles, we have used co- precipitation method. The yield obtained by the co-precipitation is more than citric gel method and the surface area of the material obtained is more. In Co-precipitation method, the mixture of analytical grade (8.08gm) of Ferric Nitrate [$Fe(NO_3)_3$] (1M) and (4.723gm) of Calcium Nitrate [$Ca(NO_3)_2$] (1M) is prepared with the help of Distilled Water. The mixed metal ion solution is then slowly added to the mixed solution of $NH_4OH$ (1M) & $NH_4HCO_3$ (1M) under constant stirring at 70°C for 1 hour.The solution was filtered and washed with

distilled water (10ml) & Ethyl alcohol (5ml) & then dried in oven for 2 hours at 80°C. Reddish brown powder was collected and subjected for calcinations at 600°C, and 800°C .

**3.Characterization**

The chemical composition of calcined compound was interpreted with the help of FT-IR technique. IR spectroscopy measures the vibration of atoms and based on this it is possible to determine the functional groups. In general, stronger bonds and light atoms will vibrate at a high stretching frequency (wave number).The data obtained with the help of IR spectroscopy was correlated to the group of the particular wavelength to study the bond formation in ferrite material.

## RESULTS AND DISCUSSION

FIIR spectroscopy is an imperative vibrational technique to identify the different bond formation in the material. The FTIR spectra in Figure1 and Figure2 of the calcium ferrite nanoparticles (calcined at 600°C and 800°C respectively) were recorded in 400-4000$cm^{-1}$ranges.

As shown in Figure1 and Figure 2 the FT-IR spectrum displays the characteristics peaks of the ferrite skeleton. The band appears at 3747 $cm^{-1}$ is assigned to the stretching vibration of the O-H bond (due to adsorbed water) at the surface of calcium ferrite nanoparticles (R. M .Silverstein et al 2005). The bands at 874-875 $cm^{-1}$correspond to Fe-O-H bending vibrations in α FeOOH ( M.G.Ruiz et. al, 2009). The bands appears at 435$cm^{-1}$ and 546$cm^{-1}$correspond to the stretching vibrations of the metal oxygen bonds ie Ca-O and Fe-O **(**S.Rana et al 2010**).** Figure 2 gives more accurate description of all the observed bands in FT-IR spectrum.

**Figure 1**

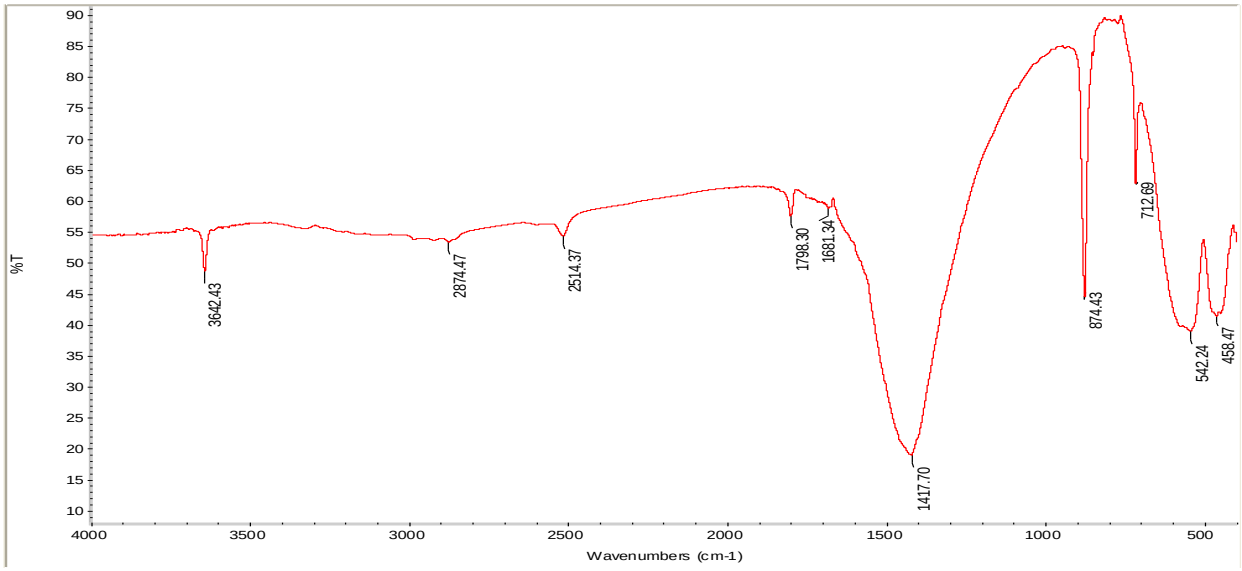
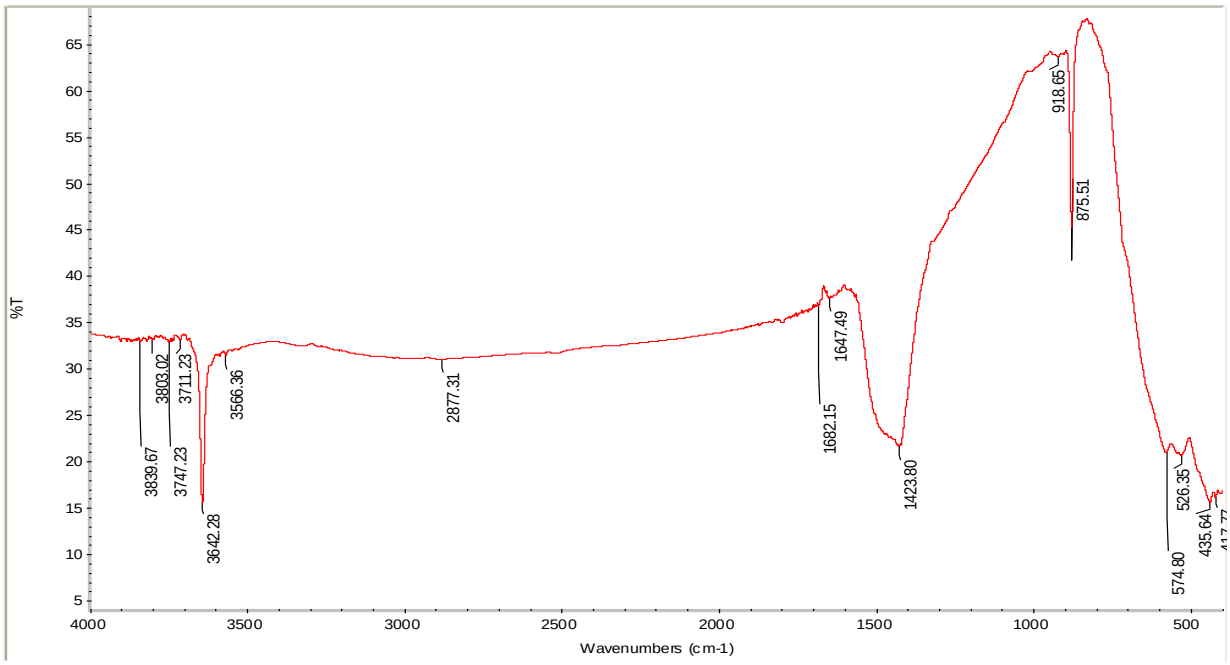



**Figure 2**



## CONCLUSION

The successful synthesis of Calcium ferrite [$CaFe_2O_4$] nanoparticles by the co-precipitation method is reported. The FT-IR characteristic bands revels the formation of material and analysis ensure the absence of impurities. The material calcined at 800°C has good agreement of FT-IR values with reported data. The future work includes characterisation by using XRD analysis, morphological study and use of material as a catalyst for selective oxidation reactions.

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# STABILITY OF GLYCOSIDES LINKAGE WITH PIGMENTS OF IXORA COCCINEA

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**Abstract:**
*Ixora coccinea* having pharmaceutical and industrial applications. Due to its attractive color of flowers paid attention towards pigments as well as its sugar constituents. Pigments and sugar was isolated by green solvent and green method which is cheap, ecofriendly, and time saving. The stability of glycosides linkage with pigment was studied with increase in temperature.
**Keyword**: Jungle geranium, kaempferol, UV-spectroscopy.

## INTRODUCTION

*Ixora coccinea* (Rubiaceae) is a small shrub having 500 species. It is native to south India, Bangladesh, Srilanka. It is also called as "Jungle geranium, flame of wood". Its phytochemical analysis exhibited glycosidic linkage of quercetin and kaempferol (M. S. Baliga et. al, (2012).The water soluble phenolic compounds are present in green vegetables as well as plants. The colour differences in flowers, leaves and stem branches depend on nature of pigment and its concentration .Glycoside linkage of derived from pigments may or may not be water soluble. Therefore, Present study was focused on water soluble glycosides linkage with the pigments and its stability.

## Material and Methods:

**Plant material:** *Ixora coccinea* collected from VPM's B.N.Bandodkar College of Science, Thane (w)-400601 in the month of September 2017.The Aerial parts were segregated and washed well and used for study.

The green solvent –double distilled water was used throughout the study.

**METHODs:**

Isolation of pigments was carried out by green solvent from aerial part of *Ixora coccinea* and sugar from flowers. Wet 15 flowers (5g), 2 big leaves bunch (5g) and 2.009gm of branch and 50 $cm^3$ double distilled water, subjected to magnetic stirrer with increasing in temperature from room temperature to $40^0$Cfor 2hrs. Separately. The process is continued till source imparts its color to distilled water. The color of flower become white, leaves and branches becomes yellow tendrils. After centrifugation, filtrate and residues was evaluated for its change in color and stability at -4ºC, 25ºC and 40 °C for 30 days. The samples were explored for the TLC, U.V. Spectroscopic analysis.

The flowers are good source of Sugar that was isolated from placenta of *Ixora coccinea* by simple green method. The flower without placenta was used for pigment isolation and compared it with placenta color.

## RESULT/DISCUSSION:

Ariel part of *Ixora coccinea* was washed with distilled water and segregated. 15 flowers (5g), 2 big leaves bunch (5g) and 2.009gm of branch were used for the study of dyes from it. The samples were stirred on magnetic with normal temperature showed that dark in color .The test for imparting pigment from aerial part was visualized by naked eyes. Stirred samples after centrifugation, filtrate was concentrated which exhibited in (figure1) and its residues shown in figure 2.

| | Filtrate λmax | Residue λmax |
|---|---|---|
| Flower | 262.00 | 198.50 |
| Branch | 291.00 | 1076.50 |
| Leaves | 262.00 | 1048.00 |

**Table 1** λmax of Filtrate and residue.

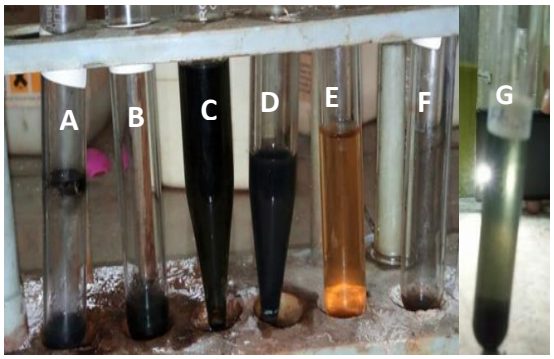


**Figure 1** Aerial part of Ixora *coccinea* with distilled water was stirred and after reduction the filtrate- ***A.*** Dark green color of leaves, **B.** Dark red color of flowers. **C.** Dark green with tint of red color observed for branches, **D.** after dilution it changes it color to greying blues, **E.** Flower dye diluted 100times showed oranges red color, while **F**. their residues all were in darkest green color mask. **G**. Change in color from red to green when added acid.

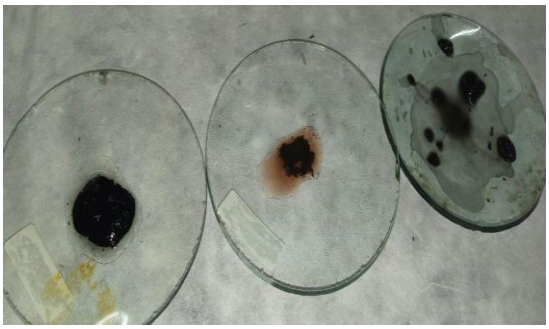

**Figure 2** After centrifugation of aqua extract of residue of **A.** Branch **B.** Flower and **C**. Leaves.

Dye component in filtrate at $R_f$ values in common may be 0.33 to 0.36 and 0.56 to 0.64 observed in all samples while the formulated dye/residues showed flower aqua extract 0.18, leaves extract 0.33, 0.54 and branches extract showed 0.36, 0.64 and 0.83. The formulated dye/residues was evaluated for its stability at 25°C and 40 °C for 30 days. No change in color was observed in all cases except branches it was oxidized. When all samples stored at -4ºC flower showed beautiful bright and attractive crystal was observed and leaves showed greenish moist mask, and branches residue crystalline forms. The stability of color extract was evaluated for the period of one month by using UV- Visible spectroscopy (table1) there is no change in λmax. The formulated component/residue is very much sensitive to acid and alkali. Change in color was observed in case flower from red to green Figure 1G). The pigments observed from without placenta showed change in color may be due glycosides linkage to phenolic quercetin. Derivatization of sugar from placenta with simple methods which is nothing pipetting from it. The sugar is white in color. (Figure 3.)

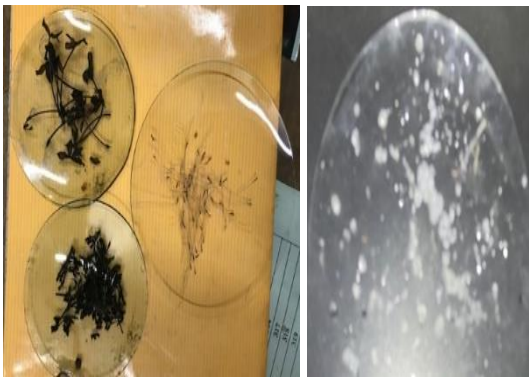

Figure 3 Sugar isolated from flowers and crystalized by freezing method.

## Conclusion:

*Ixora coccinea* was collected with green techniques pigment was isolated which is water soluble. Change in color was observed as its dilution increases. The stability of the pigments is good at room temperature as well as at -4ºC. The therapeutic applications of this flower may be due to glycoside linkage with flavanone and drugs. Hence, it is having wide pharmaceutical applications.

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We are grateful to Vidya Prasarak Mandal and Dr. (Ms.) M.K.Pejavar, Principal VPM's B.N.Bandodkar College of Science for providing facilities and Dr. D.R. Ambavadekar head of the Chemistry department for encouragement.

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# STUDY OF NOISE LEVELS DURING GANESH FESTIVAL IN THANE AND MUMBAI, M.S. INDIA

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## ABSTRACT:

Noise is the sound that is unwanted at a particular period of time or disrupts one's quality of life. Noise pollution is becoming a serious threat for human as well as for wildlife as it disturbs the harmony of all organisms and increases mortality rate in them. Indian festivals are traditionally celebrated with songs and dance in large groups, using musical instruments, drums etc. The present study deals with the assessment of noise level during Ganesh festival in Mumbai and Thane as Ganesh Utsav is celebrated all over India, but the maximum festivity is witnessed in Mumbai and Thane. Three prime locations with regards to Ganesh festival were chosen in Thane and Mumbai each. To estimate the noise level Multinational Sound Level Meter compatible with standards of IEC651 type II, ANSI 1.4 type II was used. L10, L50, L90 Values for noise were calculated for each location using Histograms. During the study highest noise level was measured at M1 location in Mumbai and T2 Location in Thane and the readings were 119 dB and108.46 dB respectively which were higher than the average noise level at regular days i.e. 63.20dB for Thane and 69.04 dB for Mumbai.

**KEYWORDS:**

Noise, Ganesh festival, Mumbai, Thane.

## INTRODUCTION:

Noise is pressure oscillations away from the source in air, water or any medium. Because of certain characteristics, noise is a qualification of sound that limits or restricts the relation between a person and the physical, natural and social environment (Tripathy et. al.1999). The degree of environmental noise differs for a considerable part of the world population, especially in regions with a dense populace and transportation networks (Dorina Pojani, 2012). It is a growing concern in most developing countries and needs to be monitored for the preservation of the environment as whole. Like other forms of pollution, Noise also has broad-ranging adverse health, social, and economic impacts (Dorina Pojani, 2012).Uninterrupted high level of noise can cause serious stress on the acoustic, non-acoustic, and nervous system of the city dwellers. (Alamet.al. 2006). Noise

pollution also leads to severe physical and psychological problems giving rise to irritation, decreased human performance and actions respectively(Fyhri and Klæboe.R. 2009).Sound intensity exceeding 80 dB is detrimental to each age level in today's lifestyle (N.U.Singh *et.al*.,2013).Festivals form an integral part of India's rich and diverse cultural heritage. These festivals have cultural significance; some have religious origins whereas others involve seasonal change (Praveen Shivhare and Deepak Rastogi, 2016). Festivals like Ganesh Chaturthi, Durga Puja, and Diwaliare occasion for immense happiness and celebrations across the country but with these festive seasons there is an increase in pollution load. Indian festivals are traditionally celebrated with songs and dance in large groups, using musical instruments, drums etc. According to Concha-Barrientos 'impulse noise' is created due to Bursting of fire crackers during a celebration which is of high intensity and frequency. The most celebrated festivals in Indiaarethe spectacular festival of Ganesh Chaturthi and grandiosity of the festival is determined by the noise created during its celebration. With improvement and advancement in the technology, loudspeakers are easily available ata relatively cheap price. Along with the loudspeakers traditional instruments like dhol, tasha and pakhwaj are also dominating the festival over the years. This has added to the rising decibel levels.

**STUDY AREA:**

Ganesh Utsav is celebrated all over India, but the maximum festivity is witnessed in Mumbai, Pune, and Thane and across Maharashtra. Both Thane (latitude 19˚12'N, longitude 72˚58'E) and Mumbai (Latitude 18˚55'N, longitude 72˚54'E) are among the most over crowded cities with Marathi population and have maximum number of organization celebrating Ganesh Festivals. The present study was conducted during the Ganesh festival 2014 in Thane and Mumbai at six different locations. Three locations each from thane and Mumbai as follows.

Table 1:Study locations.

| Thane | | Mumbai | |
|---|---|---|---|
| T1 | Vartak nagar | M1 | Lalbaug naka |
| T2 | Upvan | M2 | Ganesh gulli |
| T3 | Talao pali | M3 | Bharatmata theatre junction |

The reason behind choosing above study locations is to monitor and estimate impact of the noise in different zones of two cities. In case of Mumbai, Lalbaug and Ganesh Gulli are residential areas where as Bharatmata is a junction point. Vartak nagar and Talao Pali are among the most crowded areas in Thane. Upvan Lake is situated near the Sanjay Gandhi National Park. During Ganesh Festival Talao

Pali and Upvan equally act as the place for Ganesh immersion. Hence in all the festival has huge cultural and holistic importance

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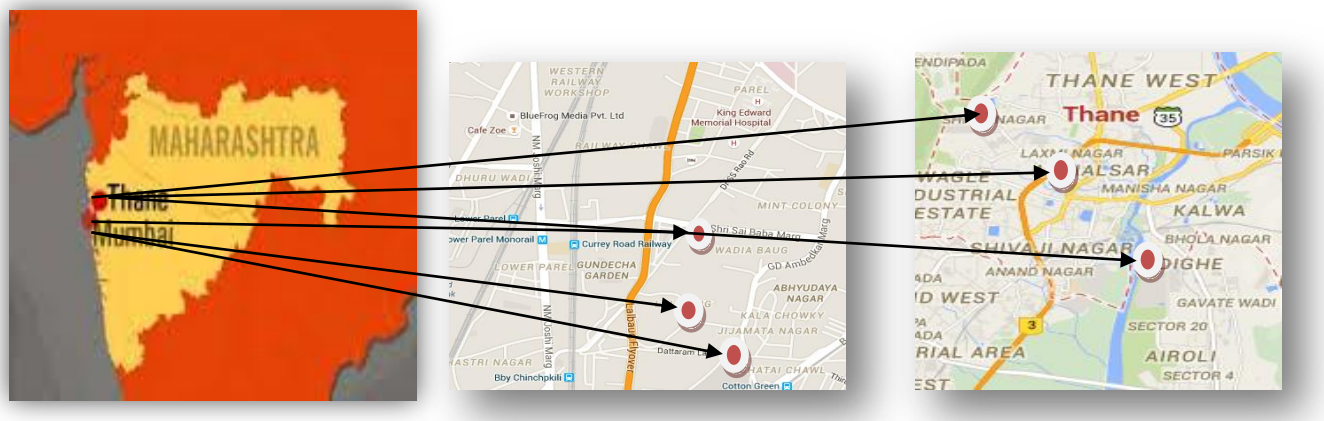



## MATERIALS AND METHODS:

According to The Noise pollution(Regulation and Control)Rules,2000 it is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards with respect to noise.The permissible limits of noise levels for different urban areas prescribed by the Noise Pollution (Regulation and control) Rules, 2000 are given in the table below

.

Table 2: Noise standards for Ambient Noise level

| Code | Category of area | Limits in dB(A) | |
|---|---|---|---|
| | | Day time | Night time |
| A | Industrial | 75 | 70 |
| B | Commercial | 65 | 55 |
| C | Residential | 55 | 45 |
| D | Silence zone | 50 | 40 |

Measurement of noise level was done by using multinational Sound Level Meter compatible

Measurement of noise level was done by using multinational Sound Level Meter compatible with standards of IEC651 typeII, ANSI 1.4 type II. The calculations and interpretations were done graphically using histograms.

## RESULTS AND DISCUSSION:

Following are the Tabular (Table 1 and Table 2) and graphical (Figure 1) representation of the observed values of noise for all 6 study locations:

Table 3: Percentile Level of Noise for Study Area: Thane

| Noise Values | Location | Study Period | | |
|---|---|---|---|---|
| | | Day 1 | Day 2 | Day 3 |
| L10 | T1 | 74.78 | 89.84 | 87.42 |
| | T2 | 88.26 | 97.92 | 108.5 |
| | T3 | 68.9 | 103 | 108.3 |
| L50 | T1 | 65.67 | 76.8 | 77.24 |
| | T2 | 81.26 | 89.56 | 97.58 |
| | T3 | 64.48 | 88.07 | 101.3 |
| L90 | T1 | 60.06 | 70.79 | 65.26 |
| | T2 | 70.15 | 81.91 | 90.92 |
| | T3 | 60.05 | 81.61 | 92.33 |

Table 5: Average noise levels across 6 locations during ordinary days

| Thane | | | Mumbai | | |
|---|---|---|---|---|---|
| T1 | T2 | T3 | M1 | M2 | M3 |
| 61.52 | 61.38 | 66.71 | 70.71 | 63.61 | 72.80 |

Table 4: Percentile Level of Noise for Study Area: Mumbai

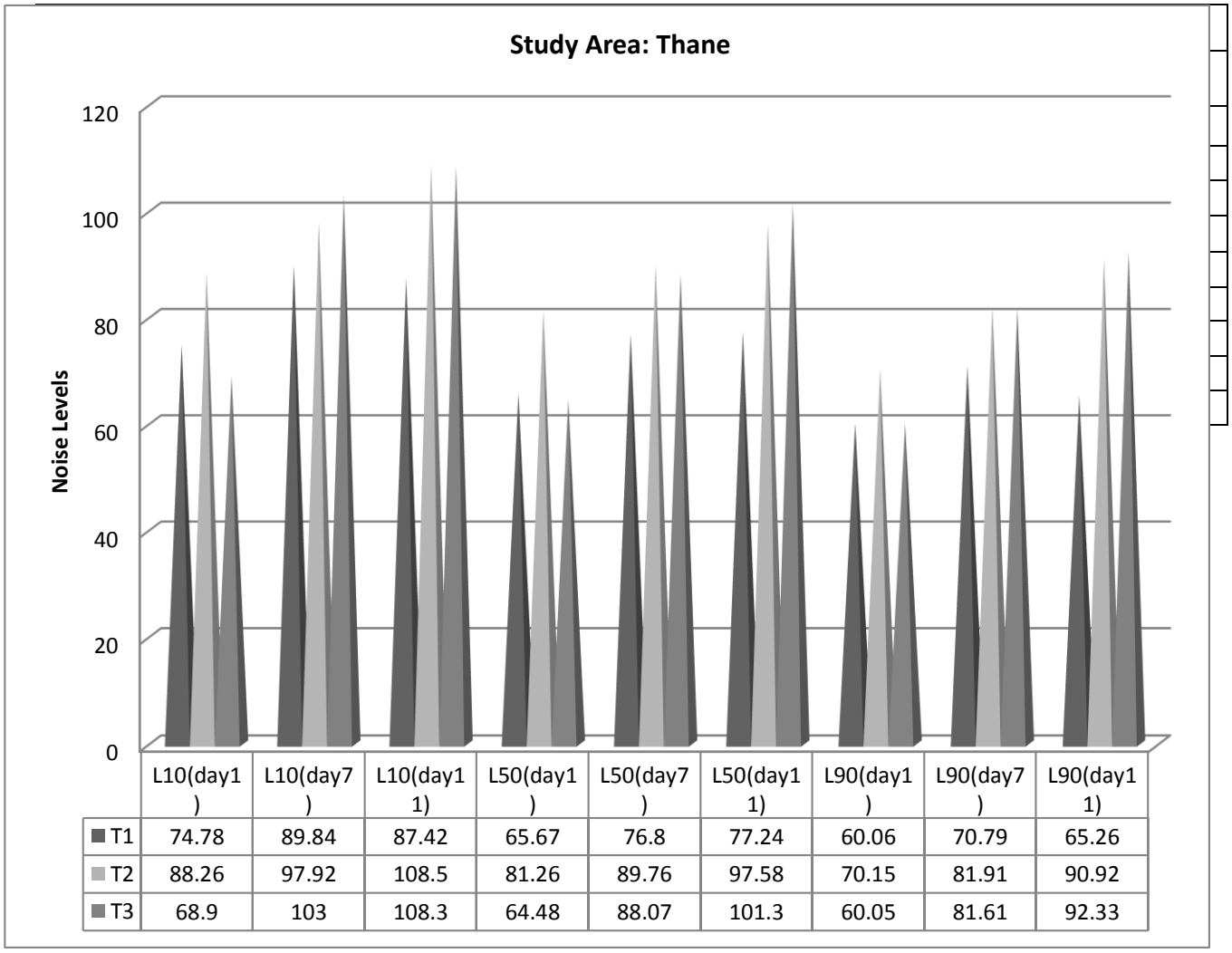
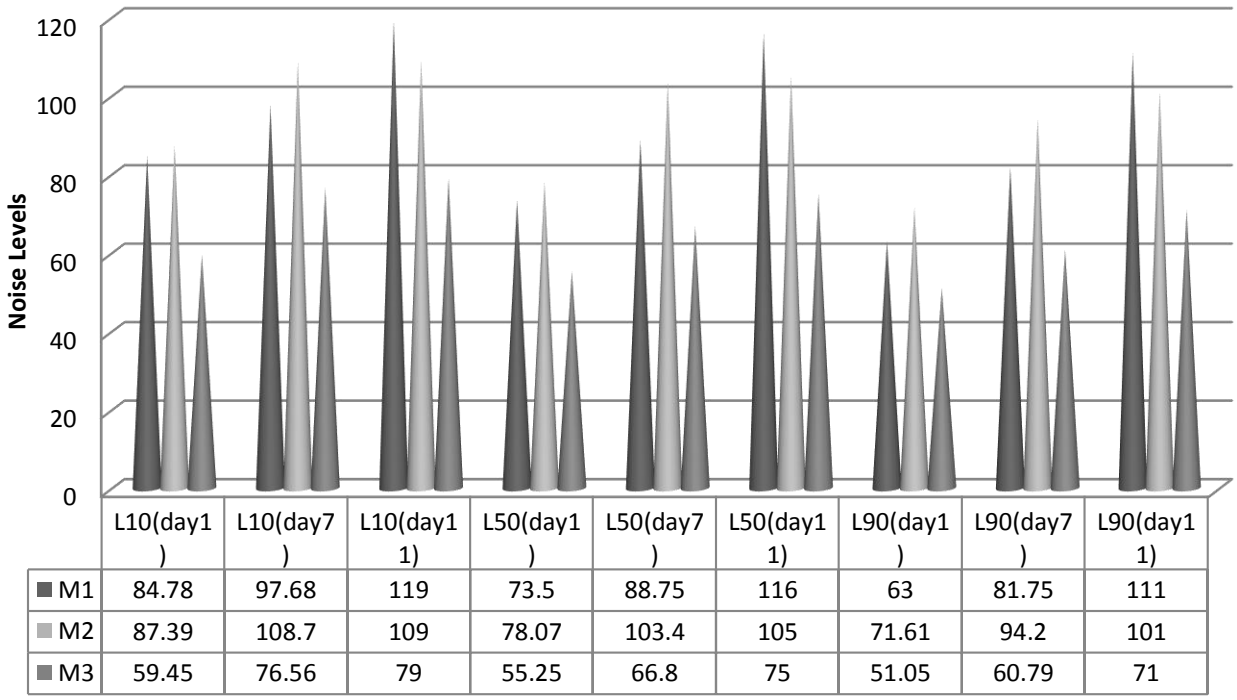


Figure 1: Percentile Level of Noise for Study Area: Mumbai




| | L10(day1) | L10(day7) | L10(day11) | L50(day1) | L50(day7) | L50(day11) | L90(day1) | L90(day7) | L90(day11) |
|---|---|---|---|---|---|---|---|---|---|
| M1 | 84.78 | 97.68 | 119 | 73.5 | 88.75 | 116 | 63 | 81.75 | 111 |
| M2 | 87.39 | 108.7 | 109 | 78.07 | 103.4 | 105 | 71.61 | 94.2 | 101 |
| M3 | 59.45 | 76.56 | 79 | 55.25 | 66.8 | 75 | 51.05 | 60.79 | 71 |

Figure 2: Percentile Level of Noise for Study Area: Mumbai

During regular days average noise levels across Thane showed noise readings in the range of 60-70 dB and Mumbai city showed noise in the range of 60-75 dB. From this it is evident that the populations in all the six study areas are regularly exposed to noise level higher than the permissible limits i.e. 55 dB for residential areas prescribed by CPCB under the noise pollution (Regulation and control) rules, 2000. The average noise levels during regular days in three study locations of Mumbai are higher than that of the three study locations of Thane.

Table 6: Lowest Noise Level

| | Highest Noise level Recorded | | Lowest Noise level Recorded | |
|---|---|---|---|---|
| Reno. | Locations | Noise level (dB) | Locations | Noise level (dB) |
| 1 | M1 | 119 | M3 | 51.05 |
| 2 | T2 | 108.46 | T1 | 60.06 |

The estimation of noise across 6 locations in and around the Mumbai metropolitan region during the Ganesh festival showed alarming results. In Present study average noise levels across all 6 locations during the sampling days was found out to be 83.60 dB. When observing the noise level for the study areas in Mumbai and Thane a trend could be observed. Noise level fornearly all locations goes on increasing as the day's progress during the Ganesh Festival. The noise levels during the immersion days exceeded the prescribed limits specified by the regulating authority on most occasions at all sampling locations.It was also observed that the L90 level on day11 at T2, T3, M1 and M2 of the study sites were above 90dB which when compared to the maximum recommended noise dose exposure level could only be tolerated for less than or up to 2 hours (NIOSH, 1998). Maximum noise levels were recorded at the M1 i.e.119 dB of all sampling locations due the number of organizations participating in the festival aiding excessive use of loudspeakers and bursting of crackersalong with the Dhols. Lowest noise level was recorded at the M3 i.e. 51.05 dB junction as it merely acts as passage for the immersion crowds with very little stationery celebrations.

In Thane highest noise levels were recorded in T2 lake area i.e.108bD. This area being in close proximity of the Sanjay Gandhi National Park such high noise level can impact humans as well as the animals in the proximity bringing a change in their behavioral pattern (Bob B.M. Wong Ulrika Candolin, 2015)**.**Lowest noise levels were recorded in the T1 area i.e.60.06 dB. It has to be noted that of all the sampling locations lowest noise levels were recorded only in those areas where stationery celebrations would lead to immense traffic congestion and as result the entire mobs of revelers had to move of these areas swiftly. Special importance has to be given to the alarming noise levels in the T2 area due to its close proximity to the Sanjay Gandhi National Park where such high sound vibrations can damage the ecological balance

## CONCLUSION:

From the study it could be concluded that Festivals like Ganesh Chaturthi which were started with a motto of bringing People together for a social Co-evaluation and their betterment has lost its virtue behind. Such festivals nowadays due to its commercialization are adversely impacting human life and also the adjoining fauna indirectly. As per the Report done by Maharashtra Pollution Control Board (2006) it may be seen from the results that noise levels were exceeding the permissible limit during the Ganesh festival in August-September 2006 at all 12 cities / towns covered during the survey. Considering the above aspects, Noise pollution has become an environmental problem in Mumbai, Thane and also in other parts of India during religious festivals. Noise affects complex task performance; it changes individual's social behavior and causes annoyance. (N.Singh *et.al*. 2004). Therefore, there is a need for increased awareness among people and it's time for Government officials and Non-governmental organizations to step forward to prevent the long-term health risks associated with noise pollution.

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We are grateful to Vidya Prasarak Mandal and Dr. (Ms.) M.K.Pejavar, Principal B.N.Bandodkar College of Science for providing facilities and encouragement.We also thankful to Mr. Dilip Shenai and Mr. Ashutosh Joshi for their valuable support.

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# STUDY OF FINANCIAL DERIVATIVES AND PARTIAL DIFFERENTIAL EQUATIONS

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## ABSTRACT-

The aim of this paper is to study financial derivatives and partial differential equations which plays important role in financial mathematics .In this paper, we study Black-Scholes partial differential equation and Hamilton-Jacobi-Bellman equation, which are useful in financial markets. Also, we discuss some useful definitions and lemma's which are useful in the development of these partial differential equations.

**Keywords:** Financial Derivatives, Black-Scholes Partial Differential Equations, Derivatives, Discount factor, Hamilton-Jacobi-Bellman equation, Variance.

## I. INTRODUCTION

Financial mathematics is an important branch of mathematics which deals with derivatives and assets. Assets of all sorts are traded in financial markets: stock and stock indices, foreign currencies, agricultural products, precious metals and many more [Brzezniak Z et al 1998]. Derivatives permit investors to customize their exposure to the market. The simplest derivative is a forward or futures contract. The first attempt to explain option prices was by Poin Care's student Louis Bachlier in 1900.This led to the development of Black-Scholes partial differential equation by Black-Scholes and Merton in 1973. For this development, Merton and Scholes won Nobel Memorial Prize in 1997 [Black F et al 1973]. Optimal control is an important aspect in financial derivatives. Hamilton-Jacobi-Bellman equation plays very crucial role in optimal control theory. It can be used as part of a strategy for solving the optimal control problem.

In our survey study, we discuss financial derivatives and the two most useful partial differential equations: Black-Scholes partial differential equation and Hamilton-Jacobi-Bellman equation. Also we study some basic definitions, derivations and lemma's which are useful in the development of Black-Scholes partial differential equation and Hamilton-Jacobi-Bellman equation [Bellman R 1957].

## II. BASIC DEFINITIONS

In this section we study some useful definitions to understand financial derivatives.

**2.1: Derivative**:

A derivative is an asset whose value depends on the price of some other underlying asset [Ross Sheldon 1999] .

**2.2: Option**

A security giving the right to buy or sell an asset, subject to certain conditions, within a specified period of time is called as an option [Wilmott P et al 1997].

**2**.3: **Annuity**

An annuity is a series of payments in equal time periods, guaranteed for a fixed number of years [Ross Sheldon 1999].

**2.4: Expiration Date**

The date on which an option right or warrant expires, and becomes worthless if not exercised is called an expiration date [Hull et al 2000].

**2**.5: **Constant Perpetuity**

A constant stream of identical cash flows without end [Hull et al 2000].

**2.6: Risk-Less Interest Rate**

The annual interest rate of bonds or other "risk-free" investments, is called as the risk-less interest rate. It is denoted by r [Wilmott P et al 1997].

**2.7: Volatility**

A measure for variation of price of a financial instrument over time is called volatility [Baxter Martin et al 1996].

**2.8: Strike Price**

The predetermined price of an underlying asset is called as strike price [Wilmott P et al 1997].

**2.9: Discount Factor**

The percentage rate required to calculate the present value of a future cash flow.

**2.10: Correlation**

A statistical measure of how two securities move in relation to each other is called correlation.

**2.11: Variance**

It is a measure of the dispersion of a set of data points around their mean value. It is the mathematical expectation of the average squared derivations from the mean.

**2.12: Portfolio**

Any collection of financial assets such as stocks, bonds and cash equivalents held by an investment institution or company is called portfolio [Wilmott P et al 1997].

**2.13: Bellman Value Function**

It represents the cost incurred from starting in state x at time t and controlling the system optimally from then, until time T.

## III. ITO's LEMMA

In this section, we study Itô's lemma and the terms useful in the derivation of Itô's lemma.

**3.1: Geometric Brownian Motion**

A continuous time stochastic process in which the logarithm of the randomly varying quantity follows a Brownian motion is called geometric Brownian Motion [Klebaner et al 1999].

**3.2: Stochastic Differential Equation**

Let $(\Omega, F, P)$ be a probability space and let $X_t$, $t, \varepsilon R_+$ be a stochastic process $X:\Omega \times R_t \rightarrow R$. Moreover, assume that $a(X_t, t):\Omega \times R \times R_+ \rightarrow R$ and $b(X_t, t):\Omega \times R \times R_+ \rightarrow R$ are stochastically integrable functions of $t \varepsilon R_+$. Then the equation

$$dX_t = a(X_t, t)dt + b(X_t, t)dW_t \quad (1)$$

is called stochastic differential equation.

Note that (1) has been understood as a symbolic notation of the stochastic integral equation.

$$X_t = X_0 + \int_0^t a(X_s, S)ds + \int_0^t b(X_s, S)dWs \quad (2)$$

The function $a(X_t, t)$ and $b(X_t, t)$ are referredto as the drift term and the diffusion term respectively.

**3.3: Itô Process**

A stochastic process $X_t$satisfying equation

$$dX_t = a(X_t, t)dt + b(X_t, t)dW_t$$

is said to be an Itô process.

**3.4: Itô Integral**

Assume that $b = b(t)$ is a stochastically integrable function in the sense that there exists a sequence $b_n$, $n \varepsilon N$ of simple processes such that

$$\lim_{n\to\infty} E\left(\int_0^T \left(b(t) - b_n(t)\right)^2 dt\right) = 0$$

Then, the Itô integral of b is defined as

$$\int_0^T b(t)dW_t = \lim_{n\to\infty} \int_0^T b_n(t)dW_t$$

3.5: **Wiener Process**

It is a continuous – time stochastic process named in honor of Norbert Wiener. It gave rise to the study of continuous time martingales [Kleinert et al 2004].

**Lemma 3.1: Itô Lemma:**

Now we state and prove Itô's lemma.

**Statement**: Let $X_t$, t ε $R_+$, be an Itô process X: Ω x $R_+ \rightarrow$ R and $f := C^2$ (R x $R_+$ x $R_+$). Then, the stochastic process

$f_t := f(X_t, t)$ is also an Itô process which satisfies

$$df_t = \left(\frac{\partial f}{\partial t} + a\,\frac{\partial f}{\partial x} + \frac{1}{2}b^2\frac{\partial^2 f}{\partial t^2}\right)dt + \frac{\partial f}{\partial x}dW_t \tag{3}$$

**Proof**: By Taylor's series the expansion of $f(X_{t+\Delta t}, t+\Delta t)$ about $(X_t, t)$ is given as follows

$$\begin{aligned} f(X_{t+\Delta t}, t+\Delta t) &= f(X_t, t) + \frac{\partial f}{\partial t}(X_t, t)(\Delta t) \\ &+ \frac{\partial f}{\partial x}(X_t, t)(X_{t+\Delta t} - X_t) \\ &+ \frac{1}{2}\frac{\partial^2 f}{\partial t^2}(X_t, t)(\Delta t)^2 \\ &+ \frac{1}{2}\frac{\partial^2 f}{\partial t^2}(X_t, t)(X_{t+\Delta t}, t - X_t)^2 \\ &+ \frac{\partial^2 f}{\partial x\,\partial t}(X_t, t)(\Delta t)(X_{t+\Delta t} - X_t) \\ &+ O(\Delta t)^2 + O(\Delta t)(X_{t+\Delta t} - X_t)^2 \\ &+ O((X_{t+\Delta t} - X_t)^3) \end{aligned}$$

Taking, limit as $\Delta t \rightarrow 0$ gives

$$\begin{aligned} df_t = \frac{\partial f}{\partial t}dt + \frac{\partial f}{\partial x}dX_t + \frac{1}{2}\frac{\partial^2 f}{\partial x^2}dX_t{}^2 + O((dt)^2) \\ + O(dt(dX_t)^2 + O\,((dX_t)^3) \end{aligned} \tag{4}$$

Consider $X_t$ is an Itô Process and $dW_t{}^2 = dt$, then from equation (4), we get

$$\begin{aligned} dX_t{}^2 &= (adt + bdW_t)^2 \\ &= a^2(dt)^2 + 2abdtdW_t + b^2dW_t{}^2 \\ &= b^2 + O((dt)^{3/2}) \end{aligned} \tag{5}$$

From equation (4) and (5), we get

$$df_t = \frac{\partial f}{\partial t}dt + \frac{\partial f}{\partial x}(adt + bdW_t) + \frac{1}{2}b^2\frac{\partial^2 f}{\partial t^2}dt$$

$$df_t = \left(\frac{\partial f}{\partial t} + a\,\frac{\partial f}{\partial x} + \frac{1}{2}b^2\frac{\partial^2 f}{\partial x^2}\right)dt + b\frac{\partial f}{\partial x}dW_t \tag{6}$$

where $W_t$ is a Wiener process.

## IV. PARTIAL DIFFERENTIAL EQUATIONS IN FINANCIAL MATHEMATICS.

In this section, we study Black-Scholes partial differential equation and Hamilton-Jacobi-Bellman equation. We study the derivation of Black-Scholes equation in detail and state Hamilton-Jacobi-Bellman equation which are useful in optimal control problems [Ingmar Glauche 2001].

### 4.1: Black-Scholes partial differential equation:

Consider a general option values V(S, t). Therefore, from Taylor's theorem we have the following series expansion for V(S, t):

$$\begin{aligned} \delta V = V_s\delta S + V_t\delta t + \frac{1}{2!}V_{ss}\delta S^2 + \frac{1}{2!}V_{st}\delta S\delta t \\ + \frac{1}{2!}V_{tt}\delta t^2 + .. \end{aligned} \tag{7}$$

We substitute $dS = vSdt + \sigma SdX$ in its discrete form, that is $\delta S = vS\delta t + \sigma S\delta X$ in equation (7), we get

$$\begin{aligned} \delta V = V_s(vS\delta t + \sigma S\delta X) + V_t\delta t \\ + \frac{1}{2!}V_{ss}(vS\delta t + \sigma S\delta X)^2 \\ + \frac{1}{2!}V_{st}(vS\delta t + \sigma S\delta X)\delta t \\ + \frac{1}{2!}V_{tt}\delta t^2 + . \end{aligned} \tag{8}$$

After, cancelling all insignificant terms in equation (8), we get

$$\delta V \approx V_s(v S\delta t + \sigma S\delta X) + V_t\delta t + \frac{1}{2!}V_{ss}(v S\delta t + \sigma S\delta X)^2 \quad (9)$$

Therefore, by taking the limits $\delta S \to 0, \delta X^2 \to \delta t \ as\ \delta t \to 0$ the above equation can be written in the following form:

$$dV = V_s(v S dt + \sigma S dX) + V_t dt + \frac{1}{2!}V_{ss}(v S dt + \sigma S dX)^2 \quad (10)$$

From equation (6), we have

$$dS^s = (v S dt + \sigma S dX)^2 = (v^2 S^2 dt^2 + 2\sigma v S^2 dX dt + \sigma^2 S^2 dX^2) \quad (11)$$

Therefore, by applying Itôs Lemma 3.1 and assuming $dX^2 \to dt$ as$dt \to 0$, then from equation (11), we get

$$dS^s \to \sigma^2 S^2 dt \quad (12)$$

Putting equation (12) into equation (10), we get

$$dV = \frac{\partial V}{\partial S}(v S dt + \sigma S dX) + \frac{\partial V}{\partial t}dt + \frac{1}{2!}\frac{\partial^s V}{\partial S^2}(\sigma^2 S^2 dt) \quad (13)$$

Now rearranging the terms in above equation, we get

$$dV = \sigma S\frac{\partial V}{\partial S}dX + \left(v S\ \frac{\partial V}{\partial S} + \frac{1}{2}\sigma^2 S^2\frac{\partial^2 V}{\partial S^2} + \frac{\partial V}{\partial t}\right)dt \quad (14)$$

This is the random walk process for V(S,t). By setting up a portfolio consisting of one option with value V(S,t) and a number -Δ of the underlying asset. The value of this portfolio will be

$$\Pi = V - \Delta S \quad (15)$$

Therefore, the change in the portfolio is

$$d\Pi = dV - \Delta dS \quad (16)$$

Now, combining equations (6), (14) and (16), we get

$$d\Pi = \sigma S\left(\frac{\partial V}{\partial S} - \Delta\right)dX + \left(v S\frac{\partial V}{\partial S} + \frac{1}{2}\sigma^2 S^2\frac{\partial^s V}{\partial S^2} + \frac{\partial V}{\partial t} - v\Delta S\right)dt \quad (17)$$

To eliminate the main contribution of randomness, we choose

$$\Delta = \frac{\partial V}{\partial S} \quad (18)$$

Now, the Δ is chosen in equation (18) such that the portfolio (15) will be deterministic i.e. it is instantaneously risk free. The change in an instantaneously risk free portfolio should equal to the exponential growth of placing money in the bank.

Therefore, putting the value ofΔin equation (18) and after simplification, we get

$$d\Pi = r\Pi dt = \left(\frac{1}{2}\sigma^2 S^2\frac{\partial^2 V}{\partial S^2} + \frac{\partial V}{\partial t}\right)dt \quad (19)$$

Finally, after substituting the value of $\Pi$ from equation (17) into equation (20) and dividing it by dt, we obtain the equation

$$\frac{\partial V}{\partial t} + rS\frac{\partial V}{\partial S} + \frac{1}{2}\sigma^2 S^2\frac{\partial^2 V}{\partial S^2} - rV = 0 \quad (20)$$

Where

$V(S,t)$ – the price for an option

S – the current option price of the stock

r – the annualized risk-free interest rate, continuously compounded

t – the time in year generally use now t = 0, at expiry t = T

$\sigma$ – volatility of an underlying asset.

This is the partial differential equation with variable coefficients, is called the Black-Scholes equation for valuing an option with values V(S, t). It plays the major role in the option pricing theory. We have derived the Black-Scholes equation for the value of an option.

### 4.2: Hamilton-Jacobi-Bellman equation:

The Hamilton-Jacobi-Bellman equation is a partial differential equation which is important in optimal control theory. Its solution is the value function known as Bellman value function which gives the minimum cost for a given dynamical system with an associated cost function [Bellman R 1957].

Consider the following problem in deterministic optimal control over the time period [0, T]:

$$V(x(0),0) = \min_{u}\{\int_{0}^{T} C[x(t),u(t)]dt + D[x(T)]\} \tag{21}$$

Where

C[ ] – is the scalar cost rate function

D[ ] – is a function that gives the economic value or utility at the final state

x(t) – is the system state vector, x(0) is assumed to be given

u(t) – is the control vector that we find, for t ε [0,T].

The system must also be subject to

$$\dot{x} = F[x(t),u(t)] \tag{22}$$

where F[ ] gives the vector determining physical evolution of the state vector over time.

For this system, the Hamilton-Jacobi-Bellman equations is

$$\dot{V}(x,t) + \min_{u}\{\nabla V(x,t).F(x,u) + C(x,u)\} = 0 \tag{23}$$

Subject to the terminal condition

$$V(x,t) = D(x) \tag{24}$$

Where

$\dot{V}(x,t)$ – derivative of V w.r.t. time variable t

a.b – dot product of vectors a and b

$\nabla V(x,t)$ – gradient of V w.r.t variable x

$V(x,t)$ - Bellman Value function.

## V. CONCLUSIONS

(i) We study some useful terms in financial derivatives.

(ii) We study the important definitions and derive Itô's lemma, which are useful in the derivation of Black- Scholes partial differential equation and Hamilton-Jacobi-Bellman equation.

(iii) Also we study the Hamilton-Jacobi-Bellman equation, arises from optimal control problem, which play very important role in financial mathematics.

## VI. ACKNOWLEDGEMENT

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# Spectroscopic Analysis of *Cinnamomum tamala* (Indian bay leaf)

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## ABSTRACT:

Spices impart the aromas, color and taste to the food and sometime produced undesirable odours. Bay leaves mainly responsible for antioxidant, majorly interest in culinary, industrial and pharmaceutical field. A numerical bioactive molecules present in bay leaves may be extracted with aqua and organic solvents. The current research article focused on spectrophotometric analysis such as UV and FTIR of *Cinnamomum tamala along with its* R*f* values that changes its chemical composition but not nature of active molecules in various solvents.

**Keyword**: Therapeutic applications, Tejpatta, Major constituents; Natural product

## INTRODUCTION:

*Cinnamomum tamala*, (Lauraceae) an Indian bay leaf, commonly known as tejpatta. It is an aromatic plant. Its leaves widely used in dried form in culinary and in pharmaceutical preparation due to its hypoglycemic, stimulant, carminative, antidiabetic (Aljamal, A., 2011;khan 2009), antibacterial, antioxidant, anti-ulcer and antimicrobial, antidiarrhoeal properties (Borhade et. al., 2013; Lohani, H.et.al, 2015; Akter, S.et. al, 2015.). The leaves is having pungent bitter, sweetish in taste. Tejpatta contain many essential oils that cure altogether gastrointestinal ailments (Khatik et. al, 2012 Choudhary, D.,2013), cough, asthma and acts as anti-inflammatory, anti-fertility (Akunna, G.G, et.al,2013) anti-depressant (Upadhyay, G et.al, 2017), anti-diabetic, anthelmintic, and anti-diuretic. Leaf is used as a component of remedies for paralysis, abdominal pain and antidote for poison (akrudeep preety and Sandeep Sharma 2016). It is also useful in vata and tridosha conditions. It diminishes cholesterol level and regulates blood pressure, dandruff and scalp infections.

*Cinnamomum tamala* is reported to constitute essential oil Eugenol, Terpene, Cinnamic Aldehyde oil Saffaral. Occurrence of four chemotypes namely, eugenol, cinnamaldehyde, cinnamaldehyde-linalool and linalool rich types were recorded in *Cinnamomum tamala* (Patrakar, R 2012; J. Parekh and S.V. Chanda, 2008; J.Rema, 2005 Shah, M 2010). Chemically, *Cinnamomum tamala* is composed of furanosesqui-terpenoids, furanogermenone, β-caryophyllene, sabinene and curcumenol, Trans-sabinene hydrate, (Z)-β-ocimene, myrcene,α-pinene,β-sabinene, sesquiterpenes , germacrene A, α- gurjunene (Ankurdeep et. al., 2016 Akanksha Rani et.al,2017). These chemical constituents responsible for therapeutic applications (Akanksha Rani et. al, 2017). M. Elmastaú et.al, 2006, revealed the radical scavenging activity.The major chemical structure observed in *Cinnamomum tamala* species from north India shown in table1. Present

paper focused on spectroscopic analysis of aqua and organic solvents bay leaves because water soluble bay leaves compound involved in our daily culinarians and the pharmaceutical preparations as well.

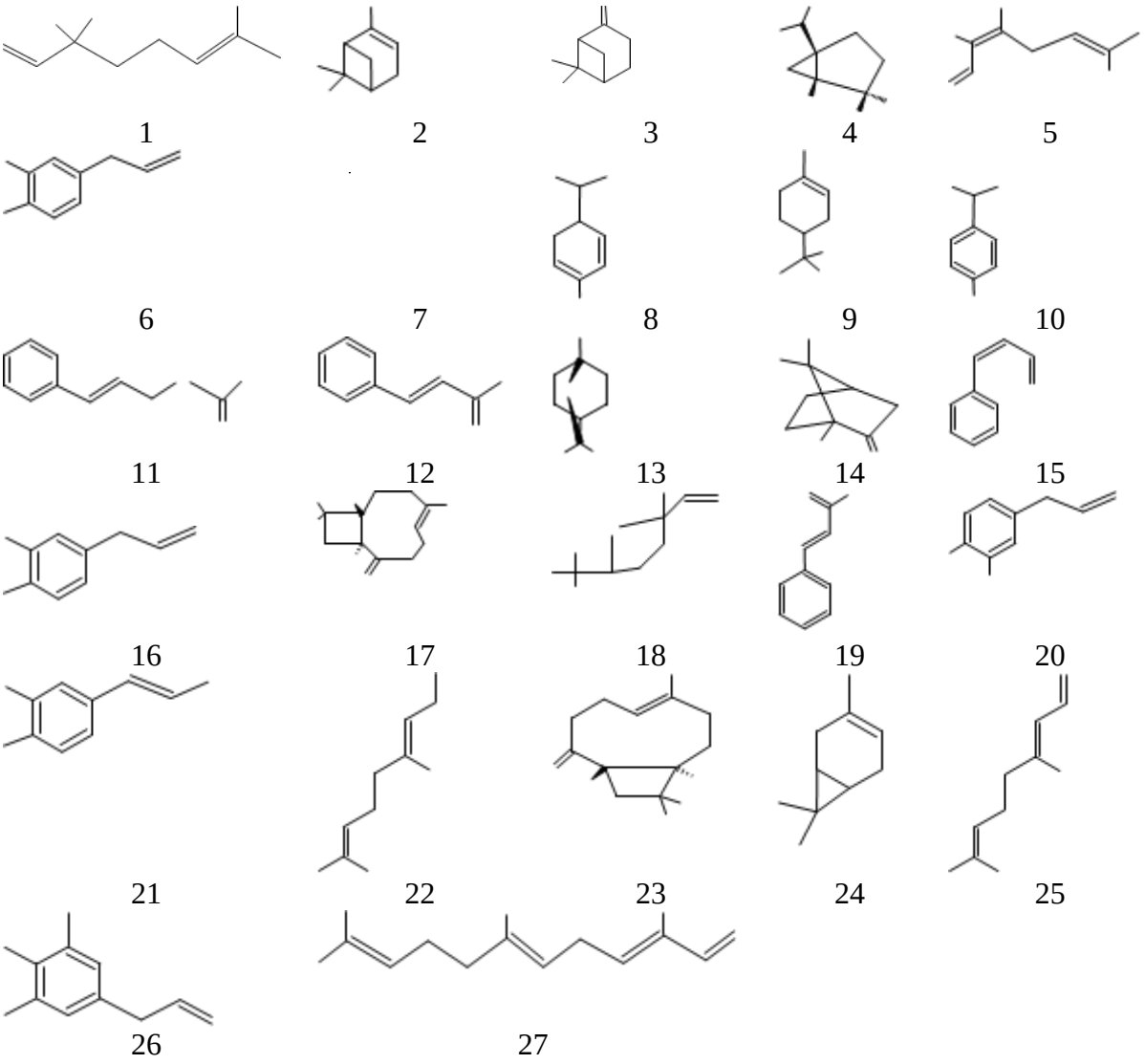


Table 1 Structure of major constituents present in Cinnamomum species from north India. (Akanksha Rani et.al,2017)

## MATERIALS AND METHODS:

**Collection of Source-**

Dried bay leaves were purchased from local market, Thane, Maharashtra in the month of September, 2017.

## Materials and Instruments:

All organic solvents, chemical used in the present work was chemically pure grade and purchased from Lobachemie. Methyl acetate and petroleum ether purchased from Analytical Research Laboratories.

The instruments used for the work were Shimadzu UV-VIS spectrophotometer, Fourier-transformed infrared spectrophotometer, UV cabinet and TLC plate.

**Methodology:**

**Preparation of extract:**

The dried bay leaves powdered (500 mg) was dissolved in 120cm3 of 95% ethanol and kept it on a magnetic stirrer 2hrs. After filtration, residue was air-dried and the filtrate was collected. The same process was repeated separately for n-hexane, petroleum ether and in Aqua solution. Samples was diluted to observed exact spectrum.

Abbreviations used for samples as follows-

1. Aqua: Sample powder + Distilled water
2. n-Hexane (NH): Residue + n-Hexane
3. n-Hexane Aqua (NHA): Filtrate of n-Hexane + Distilled water
4. Petroleum Ether (PE): Residue + Petroleum ether
5. Petroleum Ether Aqua (PEA): Filtrate of PE + Distilled water
6. Ethyl Alcohol Filtrate (EAF).

**TLC:**

All extracts (10 to 20 µL) were spotted on the plate and mobile phase was cyclohexanone and ethyl acetate (5.5:4.5 V/V).The plate was developed at room temperature in Iodine chamber.

**UV:** All extracts (10 µL) was explored in different mode such as Photometric Mode, Spectrum Mode, Quantitation Mode, Kinetics Mode and Bio method Mode.

**FTIR:** All extract was recorded on Thermofischer's FT-IR Spectrometers.

DNA and Protein Quantitation was also carried using the absorbance at 260/280 nm.

## RESULTS AND DISCUSSIONS:

Toxicological point of view, ethanol and water, as solvents, are safer than other organic solvents, and therefore more suitable in the culinary and therapeutics. Thus aqua and ethanol extracts was used in the present evaluation along with Petroleum, Ether and n-Hexane.

In the preparation for Aqua, ethanol Petroleum, Ether and n-Hexane extraction, 500 mg bay leaves were mixed with respective solvents via magnetic stirrer for 2hrs. During stirring change in color was observed in each preparations.

The total extract yields obtained by ethanol residues (45 mg) and filtrate (100 cm-3). The extract was filtered over a Whatman No. 1 paper, filtrate and residue showed their $R_f$ values 0.41 and 0.33 respectively at 259.50 nm , 269 nm was matched with 1, 8-Cineole and Linalool. Comparative analysis of all sample in UV mode shown in table 2.

Components in bay leaves are insoluble in water, but much more soluble in n-hexane, ethanol, and petroleum ether.

The total extract yielded by water residues (48 mg) and filtrate (110 cm-3) exhibited its $R_f$ was 0.57 and 0.63 at 254 nm and total petroleum ether extract yielded residues (48mg) and filtrate (112cm-3) exhibited bands with $R_f$ values of 0.76 and 0.84 at 254 nm. The total extract yielded by n-hexane residues (36 mg) and filtrate (110 cm-3) exhibited its $R_f$ was 0.82, 0.54, 0.11and 0.43

0.68 at 284. All samples were spotted in violet blue in color.
In photometric method of UV analysis, band at λ361 nm had constant values for aqua, ethanol, n-hexane, and petroleum ether. Similarly, in DNA quantification, absorption ratio (-1.000), DNA concentration (-210.32) and protein concentration remained constant for all extracts.

| | **AQUA** | **NH** | **NHA** | **PE** | **PEA** | **EAF** |
|---|---|---|---|---|---|---|
| **α** | 116.3 | - | 132.76 | 881.08 | - | 366.01 |
| **β** | 136.5 | - | 48.566 | -228.44 | - | -156.97 |
| **α + β** | 252.8 | - | 181.33 | 652.64 | - | 209.05 |
| **λ** | - | 420.00 | 420.00 | 420.00 | 420.00 | - |
| **DATA** | - | 1.528 | 1.542 | 1.549 | 1.705 | - |
| **K** | - | 368.00 | 368.00 | 368.00 | 368.00 | - |
| **K * DATA** | - | 562.41 | 567.42 | 570.00 | 627.51 | - |
| **ABS RATIO** | - | -1.000 | -1.000 | -1.000 | -1.000 | - |
| **DNA CONC.** | - | -210.32 | -210.32 | -210.32 | -210.32 | - |
| **PROTEIN** | - | 1035.2 | 1035.2 | 1035.2 | 1035.2 | - |
| **Rf values** | 0.57 and 0.63 | 0.82, 0.54, 0.11 & 0.43 0.68 at 284 | NP | 0.76 and 0.84 | NP | 0.41 &0.33 |
| **λmax** nm | 265, 290.50, 280 361 | 202,284, 354, 361 | 361 | 224,269, 284,316,361 | 254, 361 | 202.50 , 259.50, 269, 316.50, 361 |

Table 2 Comparative analysis of the samples under UV-1800 in different mode.(NP-not performed)

**FTIR spectrum:**

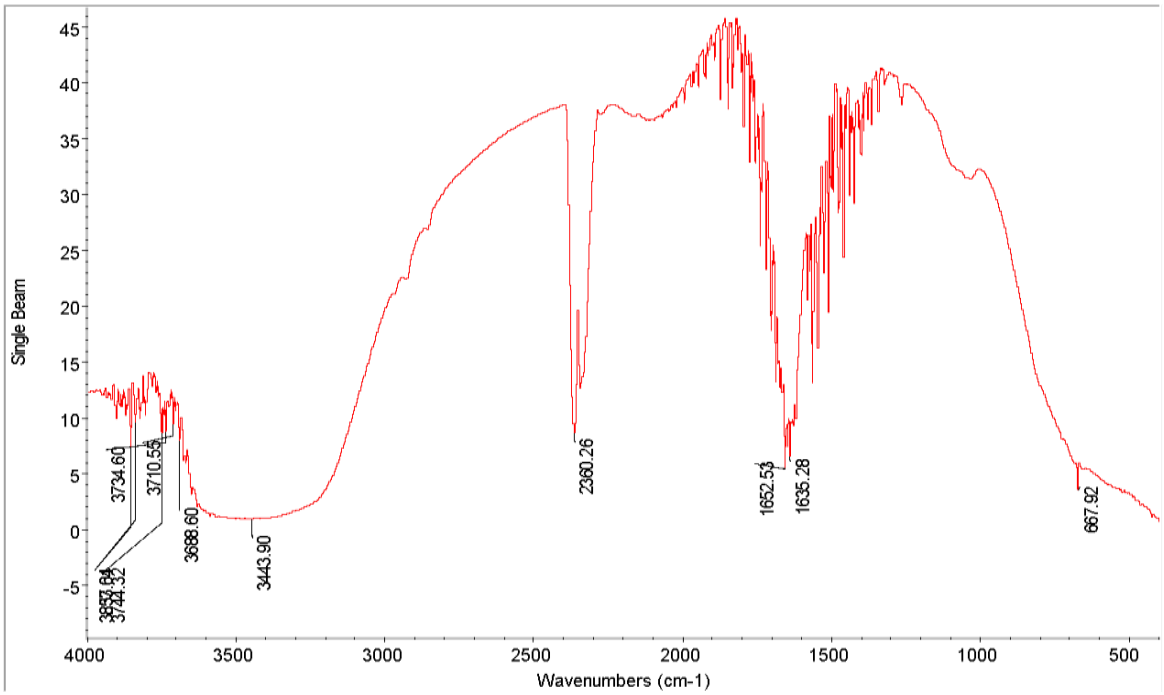


Figure 1 FTIR spectrum of Aqua Bay extract.

**Aqua Bay extract spectrum:**

3853.04 cm-1: -OH stretching,

3744.32 cm-1, 3688.60 cm-1, and 3443.90 cm-1: Highest stretching in hydrogen region and absorbance due to OH bonding; stretches of C-H.

2360.26 cm-1 C≡C compound stretches towards double bond or single bond of other carbon atom showing higher wavelength. More polar and changes hybridization in C-H bond.

1652.53cm-1, 1635.28 cm-1: C=C stretch is present. Reduction of character from C≡C to C=C bond due to conjugation. Nitrogen group present.

667.92cm-1: Disubstituted; C-H bonding out of plane which indicates presence of aromatic group. Nitrogen group present.

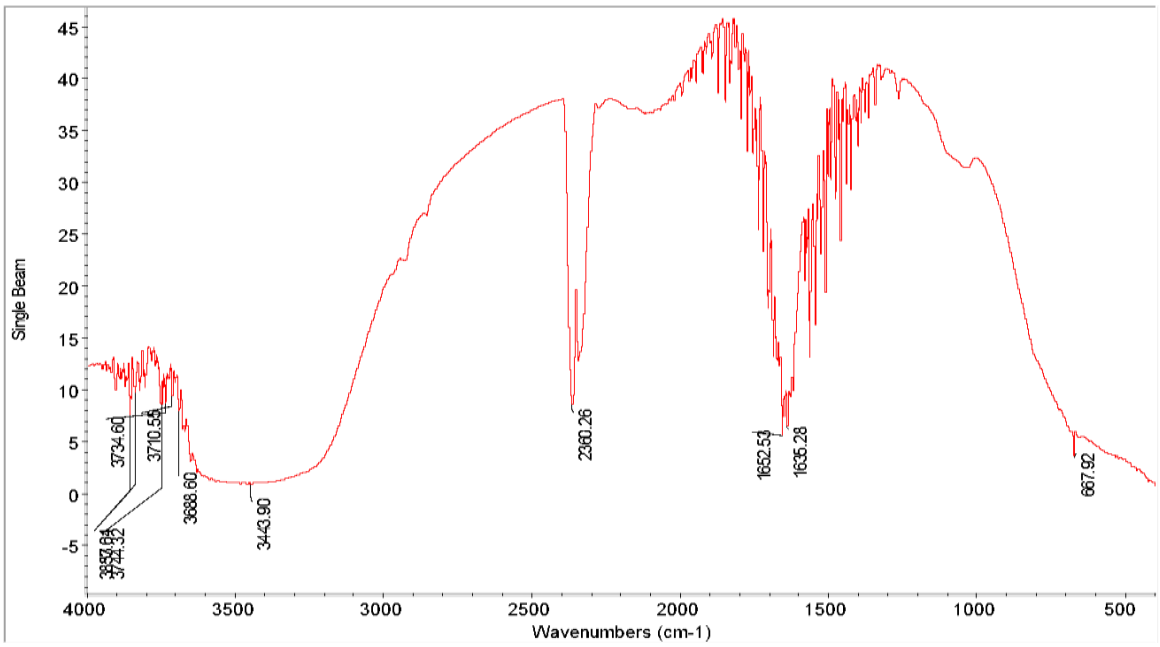


**Figure 2 A** FTIR spectrum of n-Hexane Bay extract.

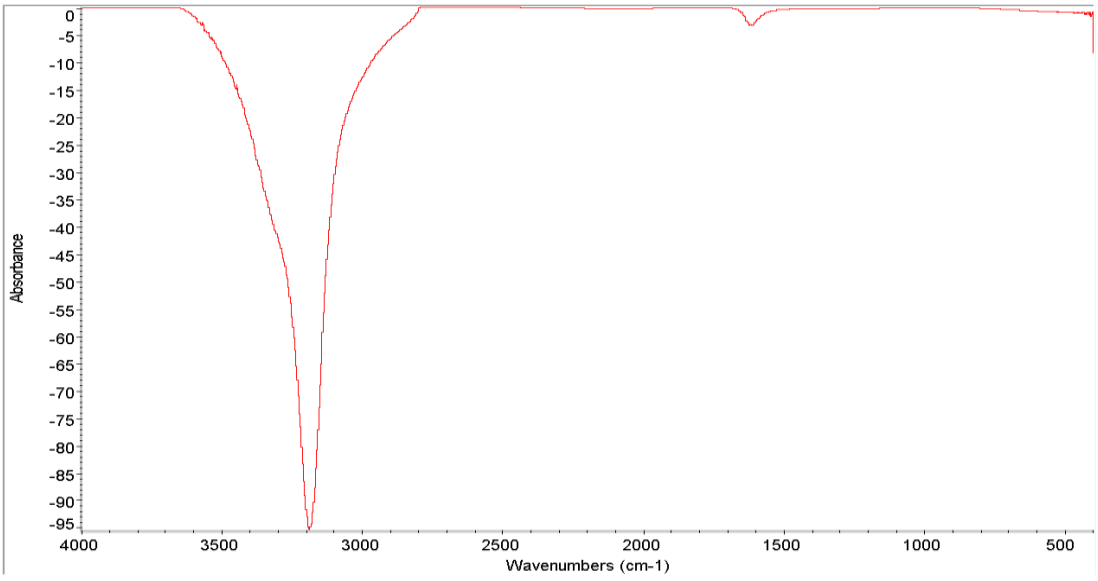


**Figure 2 B** FTIR spectrum of n-Hexane aqua condition exhibited 3200 cm-1: Highest stretching in hydrogen region and absorbance due to OH bonding; stretches of C-H.

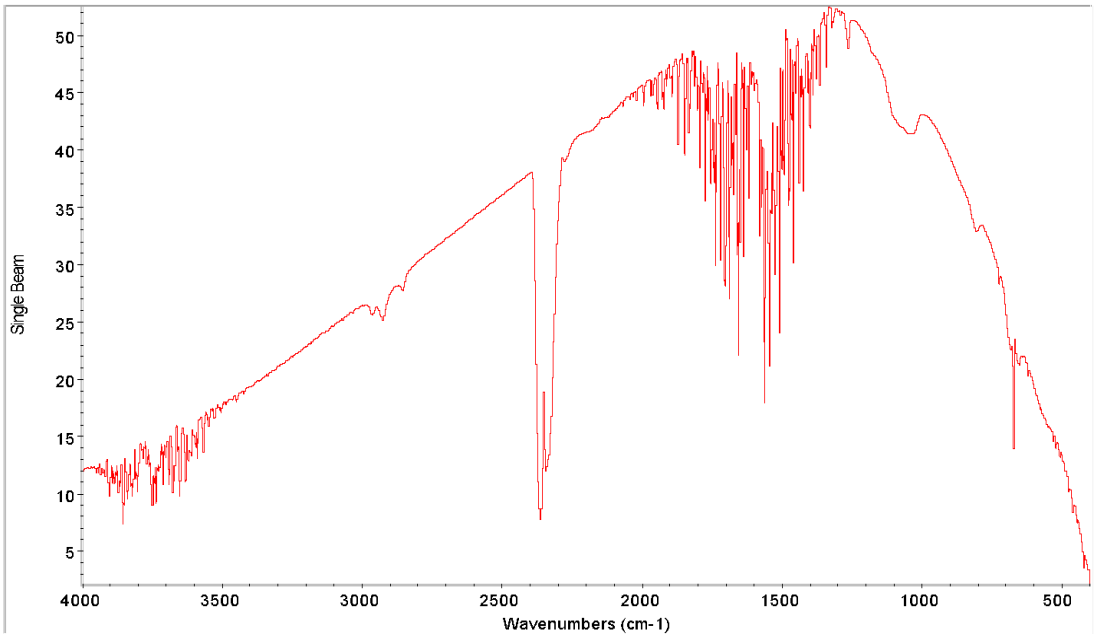


**Figure 3** FTIR spectrum of Petroleum ether Bay extract.

**Petroleum ether Bay extract spectrum:**
2450 cm-1: Broad absorption near wave numbers, 2000 $cm^{-1}$ and 2500 $cm^{-1}$ which overlaps with C-H. 1550 cm-1: Secondary -CONH group present in the sample. 700 cm-1: C=C out of plane bending vibrations rather than C-H out of plane bending.

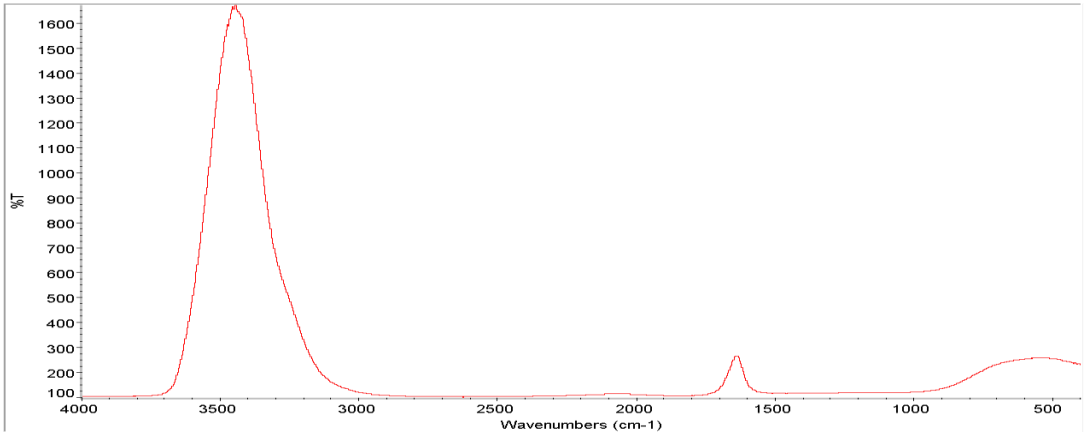


**Figure 4** FTIR spectrum of Petroleum ether aqua Bay extract.

**Spectrum of Petroleum ether aqua Bay extract:**
3400 cm-1: Alcoholic stretch with –OH present, 1650 cm-1: C=O group present along with primary amine (-NH) bending. Cyclohexane is also present in the sample.

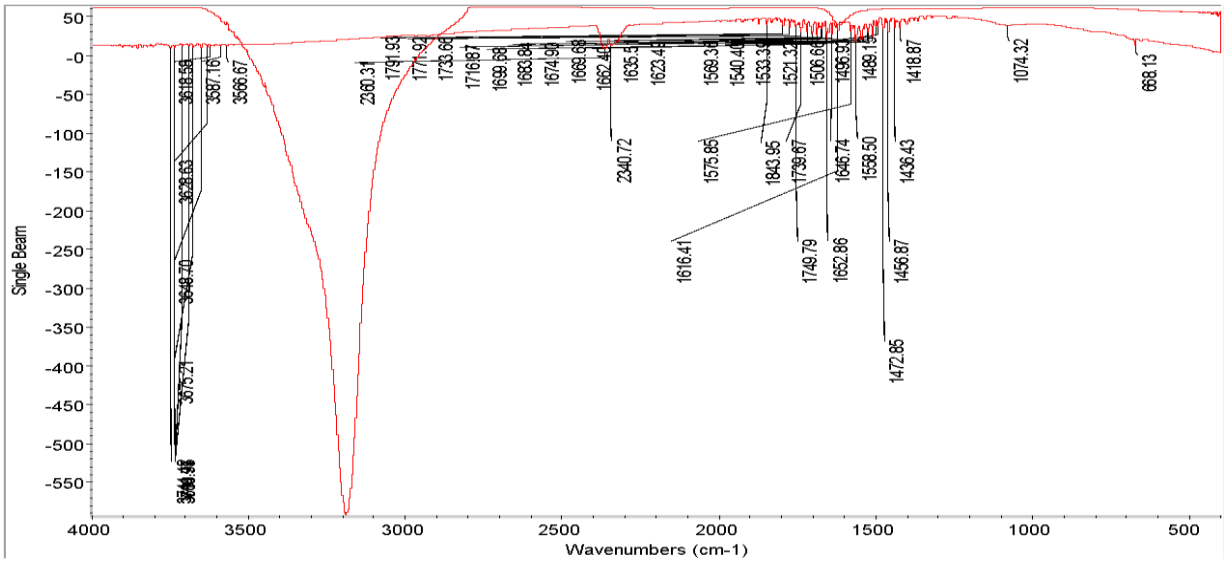


**Figure 5** FTIR spectrum of Ethanol filtrate

3853.04 cm-1: -OH stretching ,3744.32 cm-1: Highest stretching in hydrogen region and absorbance due to OH bonding; stretches of C-H,1616.41 cm-1: Aromatic C=C ring stretching, vibrational stretching, lowers conjugation from C≡O,1749.79 cm-1: Five membered cyclic ring present,1652.86 cm-1: R-CONR$_2$ associated with lactam ring,1472.85 cm-1, 1456.87 cm-1: Aromatic ring C=C stretching at meta position.

## CONCLUSION:

The change in structural behavior was observed throughout the study. $R_f$ values quantifications of biological activity is constant but its FTIR analysis showed that polymorphic change in organic compounds by showing shifting of bands in FTIR. Aqua extract wavenumber 2360.26 cm-1 C≡C compound stretches towards double bond or single bond of other carbon atom showing higher wavelength and in petroleum it was shifted toward 2450 cm-1. The wavenumber 700 cm-1 describes C=C out of plane bending vibrations rather than C-H out of plane bending while it in aqua extract wavenumber at 667.92cm-1: Disubstituted; C-H bonding out of plane which indicates presence of aromatic group shifted to higher wavelength was 700 cm-1. In ethanol, Highest stretching in hydrogen region and absorbance due to OH bonding; stretches of C-H, 1616.41 cm-1, Aromatic C=C ring stretching, vibrational stretching and at 1456.87 cm-1, Aromatic ring C=C stretching at meta position was observed throughout the spectroscopic analysis .

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