

Under the Aegis of VEDA....



SENSETRONICS

The E-Technical Magazine..



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Department of Electronics and Communication Engineering



Aditya College of Engineering
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Aditya Nagar, ADB Road, Surampalem-533437



VISION

To be a center of excellence and renowned for Electronics & Communication Engineering education and research

MISSION

M1: Enlighten the graduates in the basic concepts underlying the principles of analog and digital electronics, communication systems and advanced technologies.

M2: Provide state of the art infrastructure and research facilities.

M3: Organizing industrial programs and social activities in collaboration with industries, NSS to disseminate knowledge.

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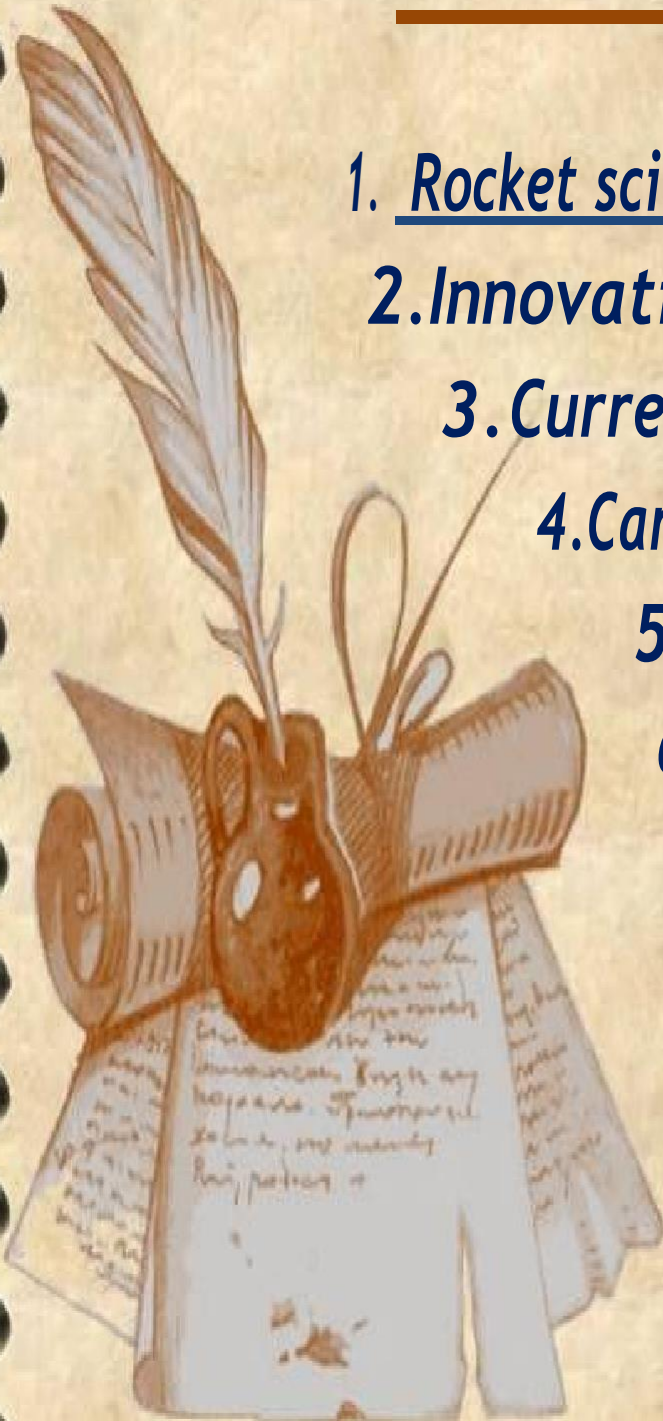
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NANDINI HARINATH - ROCKET SCIENTIST,

ISRO

The overwhelming success of India's space missions has highlighted the role of the country's women scientists. Think Indian Space Research Organization (ISRO), think Vikram Sarabhai, Satish Dhawan, G. Madhavan Nair, Rodham Narsimha and a host of geniuses. They build on an earlier generation of scientists who worked to push India's space frontiers, men who came to define the contours of the country's scientific rediscovery — C.V. Raman and Meghnad Saha. But times are changing.

Two years ago, as Indian scientists successfully put a satellite Mangalyaan into orbit around Mars, history was scripted. Away from the dour image of spectacled and formally suited nerds working on complex diagrams and theories, this



snapshot of Indian scientists, who achieved the feat in a record 15 months, was warmly refreshing — women dressed in resplendent saris, chatting gaily as they went about their work. Nandini Harinath is a rocket scientist at ISRO's (Indian Space Research Organization) Satellite Centre in Bengaluru. Nandini's first exposure to science was the popular series Star Trek on television. Her mother is a math's teacher and her father is an engineer and as a family, they were all interested in science fiction and Star Trek.

Nandini Harinath's mother is a math's teacher and her father is an engineer. As a family, they started developing an interest in Star Trek and Science Fiction. This made Nandini go for space research. ISRO was the first job which Nandini applied and it is now 20 years of experience in ISRO.

In the 20 years of work at ISRO, Nandini has worked in more than 14 missions. Nandini is now the senior scientist at the ISRO Satellite Centre located in Bengaluru. Earlier, She was the deputy operations director for the Mars Orbiter Mission (MOM) and currently, She is planning and executing science payloads operations in the Martian orbit. Nandini is also working for NASA-ISRO joint satellite named as NISAR. NISAR is planned to be launched by ISRO in 2020. Harinath says she takes "immense pride" in Mangalyaan and was "really thrilled" to see its photograph on the new ₹2,000 notes. But it was not an easy assignment and working days were long. Apart from her work, She has also published numerous publications and has also been awarded and felicitated many times. She won the "India Today Woman in Science Award" in the year 2015.

by,
B.JAGADEESH,
Asst. Prof, ECE

INNOVATION

TRANSPARENT ELECTRONICS

It is a field in electronics which aims to make electronic devices literally transparent. Transparent electronics is an emerging science and technology field concentrates on producing 'invisible' electronics circuit and optoelectronics devices.

The application contains consumer electronics such as automobile windshield, transparent solar panel, transparent display and real time wearable display. It is an emerging technology that employs wide band-gap semiconductors for the realization of invisible circuits. It is an emerging science and technology field focused on producing invisible electronic circuitry and optoelectronic devices.



There are two technologies which proceed transparent electronics are:

Transparent conductive oxides(TCOs):

TCOs materials will possess two physical properties. They are:

- High optical transparency
- High electrical conductivity

Thin-film transistors(TFTs):

TFTs is another type of technology underlying transparent electronics. It is a bridge between passive electrical and active electronic device.

HOW TO MADE TRANSPARENT DEVICES



Oxide semiconductors are very interesting materials because it combines simultaneously high and low conductivities with high visual transparency. For example: Indium oxide, tin oxide etc.,

Foldable OLEDs have substrates made of very flexible metallic foils or plastics. Foldable OLEDs are very lightweight and durable. Their use in devices such as cell phones and PDAs can reduce breakage, a major cause for return or repair. Potentially,

foldable OLED displays can be attached to fabrics to create "smart" clothing, such as outdoor

survival clothing with an integrated computer chip, cell phone, GPS receiver and OLED display sewn into it.

Transparent solar panel



The view from garden and adjacent field it look like ordinary window glass, but this window offers an additional feature i.e. it also produces an electricity. This is what the domestic power supply for future could look like. The surface areas used for producing energy are decreased due to transparent solar panel.

Up to now We've seen it in countless sci-fi movies and TV shows. However, Polytron has now created a working prototype of a transparent mobile phone. Polytron, a Taiwan based company has created a phone that is fully transparent and only the circuit board, memory card and camera unit is visible. It is a touchscreen phone that has a fully functional SIM tray, SD card slot, microphone and camera. However, the phone does not yet have an operating system.



The technology being used in the phone is called Polyvision Privacy Glass. It allows a device to turn transparent when an electric current is passed through it. They've also used microscopic wires that have been fed directly into the glass that make it barely visible to the naked eye. We've seen similar examples in the

glass strip on the Sony XPERIA Z, XPERIA P and XPERIA U.

by
BADETI YUVARANI
2nd year, ECE-C
16MH1A04D2

THE FUTURE OF CLOTHING

TECHNOLOGY-DIGITAL TRENDS

Before fashion existed, humans wore clothes to prevent themselves from freezing to death on cold winter nights, burning to death in the hot sun, or being slashed to death as they crawled through the undergrowth in search of the next meal. Even when fashion, branding, and commercialism spawned the first wave of trendy high-tech fabrics like Gore-Tex and Spandex thousands of years later, nothing much changed: They were still designed to keep us drier, warmer, cooler, or safer, and still a far cry from what most of us would consider smart, tech- infused clothing.



Then came the smartphone. Its connectivity, millions of apps, and eventual common to everyone and had a handheld computer that could connect to, monitor, and control other things. It changed the way companies thought about smart products. Shoes with pedometers built in to the heel were suddenly possible. T-shirts could monitor our heartbeat. Someone even thought messenger bags with smartphone-connected speakers were a good idea.

Nanotechnology has made fibers smarter. Conductive yarns mean the fabrics that we wear and sit and sleep on can suddenly communicate with our devices. And 3D printing could change the way we think about, produce, wear, and even buy clothes.

by
Kiran Kumar Bojja
16MH1A04D5
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CAREER GUIDANCE

Why Career Guidance is Important?

Have you ever thought about the career guidance? Well! I think majority of students do not consider career guidance a significant issue. Hence, they have no or very little realization about the importance of career guidance. As a matter of fact, career guidance is a very important aspect of your life. In fact, it can make or break your career. In this article, we will discuss about the importance of career guidance. Not just students but working professionals also should give importance to it. Usually, students and employed professionals have no idea of right career guidance. Hence in this article, I will shed some light on this issue.

Nothing Succeeds Like Success

- As we say nothing succeeds like success. And career guidance is very essential for success. If you want to see your career moving in a right direction then career guidance is of utmost importance.
- Everyone wants to be successful but they do not get the right guidance to make right decision at right time. If you have a pre-planned guidance for your career then it can make a lot of difference.
- Today, awareness about career guidance is still very low among younger generation. The culture of going to a counselor is almost nonexistent in our country.
- Therefore, for success it is important that you get right guidance from right person.

Planning your Future

- If you are a high school student then your entire future is lying in front of you. It is you with your parents who need to make right decision about your career from now on.
- It is essential that for a bright future you must start planning from now on. And for right planning you need right guidance.
- Right career guidance can tell you, about the career options that could suit you the most. Hence, you can start preparing for that option from the beginning.
- It will give you ample amount of time for right kind of preparation. This could only possible if you take guidance for your career.

Bring Clear Sight of Your Goal

- Everyone has some goal in his or her life. So, what is ambition or target as far as your career is concerned. You have to decide in advance and right career guidance could really help you in that.
- The best part of career guidance is that it is very objective as well as strategic. You could get a clear picture what your goal should be or must be.
- Otherwise it is quite normal that students fail to figure out, what they want to do in near future. Career guidance from right person could really help you to figure out perfect career for you.

- If you are confident that this is going to be your career then you can start preparing for it, from now on.

Choosing Right One from Myriads of Career Options

- Today, in the time of globalization, when there are myriads of career options, it is normal that novice students get lost in those options.
- In short, I want to say, they are not able to decide a career which is best for them. The reason for this confusion is hundreds of careers available in just one line.
- This confusion could easily be clarified with the help of career counseling or guidance. Moreover, there are people who have malice intentions. Unfortunately, there are quite a few people.
- They may not want you to succeed. Hence, they are ready to misguide you anytime. You should not fall in the trap of those people and the best way to avoid is through career guidance from right person.

Beat the Competition More Easily

- You do have friends and all are aspiring for same career that you want to be. Could you imagine the competition when so many others are competing? How is it possible that you can easily beat the competition?
- Is there a way out? Yes the best way to beat this competition is to consult a career counselor for right guidance.
- A counselor knows everything about the present state of affairs regarding a particular career option. If you are not consulting the right person for your career then you might go haywire.
- Hence to avoid confusion and deception go for career guidance.

Best Career in India or Abroad

- There are more other complex issues related to choosing a career. We will touch some of those pressing issues. One of them is whether you want to pursue your career in India or abroad.
- If the option is in India then it is OK. But if you want to go outside the country then you have to know the future prospect of the career option you have chosen. Whether in that particular country, future is good or it may not work well.
- So, the best way to find a solution is through career guidance. The Person could tell whether for a particular career you should stay in India or go abroad. Do not consult from friends or anyone else, always go for a professional advice.
- Organize Finances for Further Education Expenditure
- Today affording education has become so difficult and for many it is out of their means. However, if you get right career guidance then you can choose best colleges and courses at very affordable price.
- If you do not have any idea about the right courses or colleges then you might have to pay more. Hence, the best way to avoid this is taking right guidance because they could give you the most appropriate information.
- You could also plan for your child's future that how much you have to spend in next 5 to 10 years. You could take loan and start funding for the education of your child.

Hence career guidance could save you from all the financial woes.

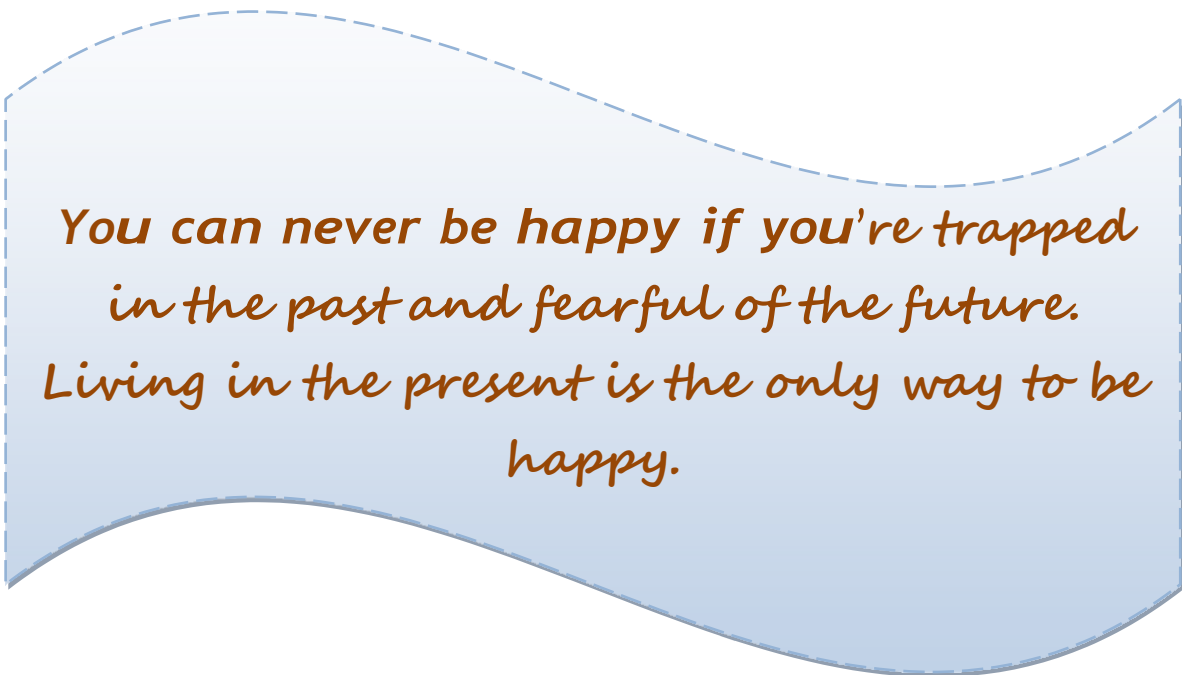
Conclusion

Finally, I will conclude by saying never underestimate the importance of career guidance. In our, country where everyone only wants a Sarkari Naukri, they hardly give any importance to other career options. You should open your mind regarding your career. Career guidance could make things a lot easier for you. Although in India the culture of career guidance is limited to big cities but you need to defy this culture and make best use of career guidance.

ECE Subject learning Websites

- ✚ www.nesoacadamy.org
- ✚ www.nptel.ac.in
- ✚ www.tutorialspoint.com
- ✚ www.daenotes.com
- ✚ www.engineersgarage.com
- ✚ www.electronicsforyou.com
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- www.mathworks.in
- ✚ www.edx.org
- ✚ www.elprocus.com


by
Maheswari Busala
16MH1A0409
ECE-A



*You can never be happy if you're trapped
in the past and fearful of the future.
Living in the present is the only way to be
happy.*

LIMERICKS

To sit in solemn silence in a dull, dark dock,
 In a pestilential prison, with a life-long lock,
 Awaiting the sensation of a short, sharp shock,
 From a cheap and chippy chopper on a big black block!
 To sit in solemn silence in a dull, dark dock,
 In a pestilential prison, with a life-long lock,
 Awaiting the sensation of a short, sharp shock,
 From a cheap and chippy chopper on a big black block!
 A dull, dark dock, a life-long lock,
 A short, sharp shock, a big black block!
 To sit in solemn silence in a pestilential prison,
 And awaiting the sensation
 From a cheap and chippy chopper on a big black block!,



ALLADI
 MAHESH
 16MH1A04C9

Song of Youth

*As a young citizen of India,
 Armed with technology, knowledge and love for my nation,
 I realize, small aim is a crime.*

*I will work and sweat for a great vision,
 The vision of transforming India into a developed nation,
 Powered by economic strength with value system*

*I am one of the citizens of the billion;
 Only the vision will ignite the billion souls.
 It has entered into me;*

*The ignited soul compared to any resource
 Is the most powerful resource on the earth,
 Above the earth and under the earth.*

*I will keep the lamp of knowledge burning
 To achieve the vision - Developed India
 If we work and sweat for the great vision with ignited minds,
 The transformation leading to the birth of vibrant developed
 India will happen.*

*I pray the Almighty:
 "May the divine peace with beauty enter into our people;
 Happiness and good health blossom in our bodies, minds and souls".*

-A P J Abdul Kalam

FROM BOOKS TO CANVAS



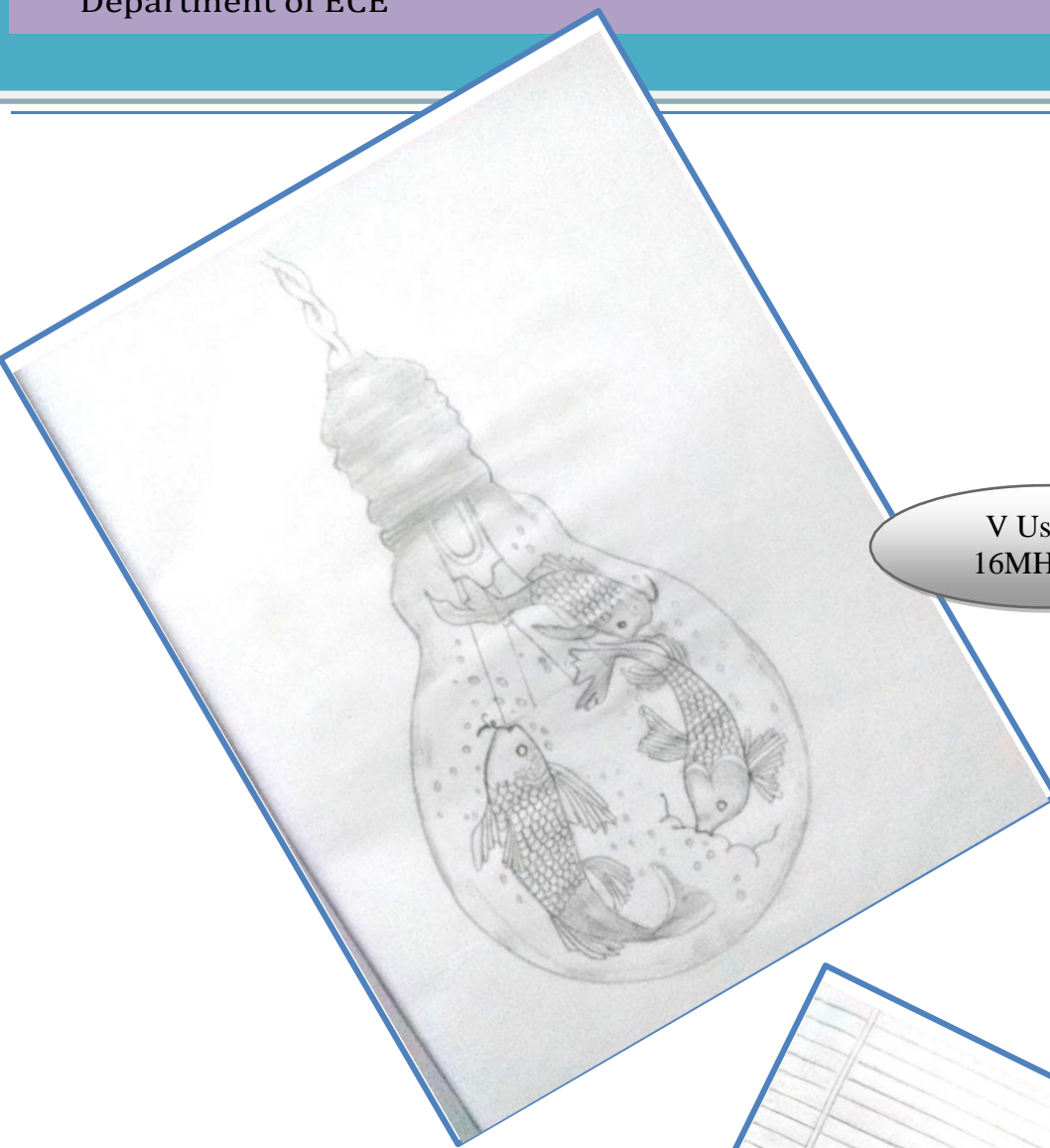
D. Sandeepthi
17MH5A0418

Luke Luck likes lakes. Luke's duck likes lakes.

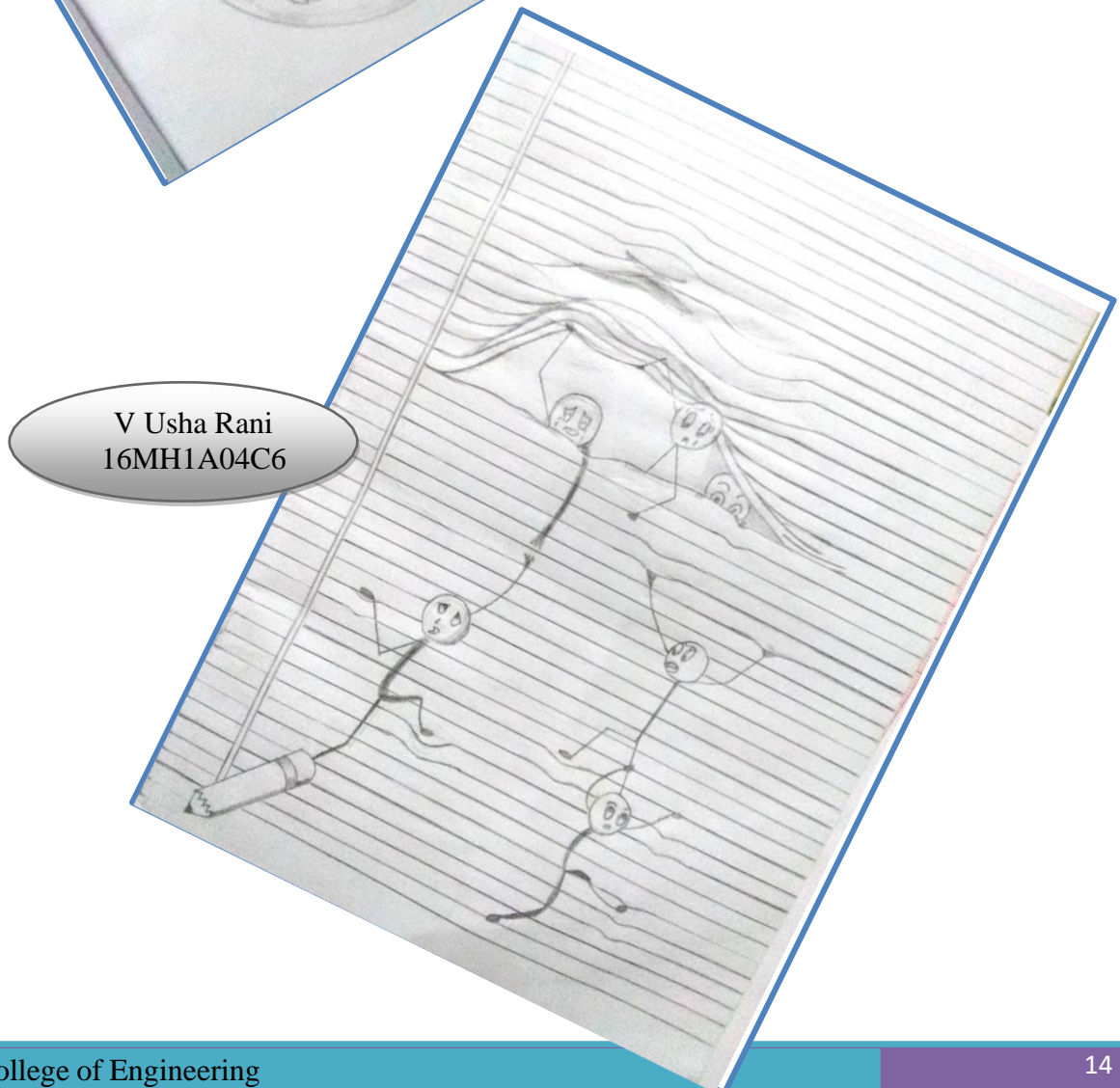
Luke Luck licks lakes. Luck's duck licks lakes.

Duck takes licks in lakes Luke Luck likes.

Luke Luck takes licks in lakes duck likes.



V Usha Rani
16MH1A04C6



V Usha Rani
16MH1A04C6

JOKES

Patient: I have forgotten so many things lately, and it's getting worse. What can I do?

Doctor: Yes, this is known illness, unfortunately it has no cure. I'd also like to remind you about that 800\$ that you owe me?

A man goes to the doctor and says, "Doctor, wherever I touch, it hurts."
The doctor asks, "What do you mean?"

The man says, "When I touch my shoulder, it really hurts. If I touch my knee - OUCH!
When I touch my forehead, it really, really hurts."

The doctor says, "I know what's wrong with you - you've broken your finger!"



by,
KASINADHANARAJU
16MH1A04F2,
2nd ,Ece – c.

HEALTH-MULTIVITAMINS

Whole foods tend to be loaded with nutrients. vitamins facilitate many of the body's mechanisms and perform functions which cannot be performed by any other nutrients.

| Eat your vitamins and minerals! | | | | | | |
|---------------------------------|---------------|--|---|---|---|--|
| Vitamin/mineral | Other name | Good for | Deficiency causes | Daily intake | Get it from | |
| A | Retinol | Eyesight, bone growth, reproduction, appetite and taste, regulating the immune system | Night-blindness | Men: 900 mcg (one millionth of a gram) Women: 700 mcg | Liver, cod liver oil, carrots, green leafy vegetables, egg yolks, enriched margarine, milk products, yellow fruits | |
| B₁ | Thiamine | Nervous system, digestion, muscles, heart, alcohol-damaged nerve tissues | Tingling in fingers and toes, confusion, difficulties in maintaining balance, loss of appetite, exhaustion and weakened powers of concentration | Men: 1.2 mg Women: 1.1 mg | Liver, yeast, egg yolk, cereal, red meat, nuts, wheat germ | |
| B₂ | Riboflavin | Growth, skin, nails, hair, eyesight, breakdown of protein, fat and carbohydrates | Itchy irritated eyes, itchy mucous membranes (nose, mouth, throat) and cracked corners of lips | Men: 1.3 mg Women: 1.1 mg | Milk, liver, yeast, cheese, green leafy vegetables, fish | |
| B₆ | Pyridoxine | Preventing skin conditions, nerve problems, helping the body absorb protein and carbohydrates | Skin inflammation | 1.3 mg (seniors and pregnant women should aim higher) | Fish, bananas, chicken, pork, whole grains, dried beans | |
| B₉ | Folic Acid | Production of red blood cells, essential in first three months of pregnancy to prevent spina bifida, cleft palate or cleft lip | Tiredness due to anemia and red tongue | 400 mcg (pregnant women should aim for 600 mcg) | Carrots, yeast, liver, egg, yolks, melon, apricots, pumpkin, avocado, beans, rye and whole wheat, green leafy vegetables | |
| B₁₂ | Cobalamin | Making red blood and the formation of the nerves | Tiredness and fatigue, tingling and numbness in hands/feet, memory problems and anemia | 2.4 mcg | Eggs, shellfish, poultry, meat, liver, milk, cheese, fortified cereal | |
| C | Ascorbic acid | Immune defence system, protection from viruses and bacteria, healing wounds, reducing cholesterol, cell lifespan and preventing scurvy | Tiredness, bleeding gums and slow-healing wounds | Men: 90 mg Women: 75 mg | Citrus fruits, kiwi fruit, berries, tomatoes, cauliflower, potatoes, green leafy vegetables, peppers | |
| D | None | Strong bones and teeth | Unhealthy teeth, weakening of bones, rickets in children | 600 IU (international units) | Sunlight (our bodies manufacture vitamin D when sun contacts skin), cod liver oil, sardines, herring, salmon, tuna, milk, milk products | |
| E | Tocopherol | Fighting toxins, protecting cells from damage, supporting immune function, DNA repair and metabolic processes | Weak muscles and fertility problems | 15 mg | Nuts, soya beans, vegetable oil, broccoli, sprouts, spinach, whole meal products, eggs | |
| Ca | Calcium | Strong bones and teeth, nerve function, muscle contraction, blood clotting | Poor teeth and brittle bones | 1,000 mg | Milk, cheese, butter, yogurt, green leafy vegetables | |
| Fe | Iron | Red blood cells and muscle function, white blood cells and the immune system | Tiredness, irritability, difficulties concentrating | Men: 8 mg Women: 18 mg (Vegetarians need double) | Lean red meat, oily fish, egg yolks, green leafy vegetables, nuts, whole grains, whole wheat | |
| Mg | Magnesium | Converting energy from food, cell repair, building strong bones, teeth and muscles and regulating body temperature | Muscle spasms, and has been associated with heart disease, diabetes, high blood pressure and weak bones | Men 19-30: 400 mg 31+ 420 mg Women 19-30: 300 mg 31+ 320 | Green leafy vegetables, whole grains, nuts | |
| Zn | Zinc | Immune system, the breakdown of protein, fat and carbohydrates | Lesions on skin, eyes and in throat, loss of taste and smell, hair loss, diarrhea, slow healing of wounds and growth problems in children | Men: 11 mg Women: 8 mg | Meat, shellfish, milk, brown rice, whole grains | |

In general, getting your nutrients from foods is better than getting them from supplements.

Kale is extremely healthy. It has Vitamin K1: 900% of the RDI, Vitamin C: 134% of the RDI, Copper: 111% of the RDI. Furthermore, kale is also high in fiber, manganese, vitamin B6, potassium and iron.

Seaweed — such as kelp, nori, kombu and wakame — are all very rich in iodine.

Yellow bell peppers are one of the best dietary sources of vitamin C. about 186 grams, provides almost 600% of the recommended daily intake of vitamin C, which is 75–90 mg.

by,
BOKKA LAYASREE
16MH1A0408

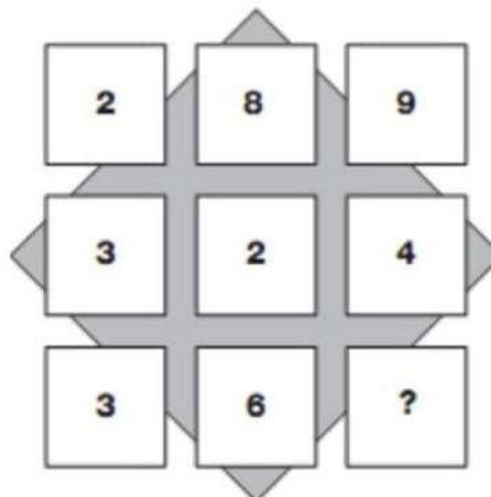
RIDDLES

1. *What is missing from the Hexagon?*



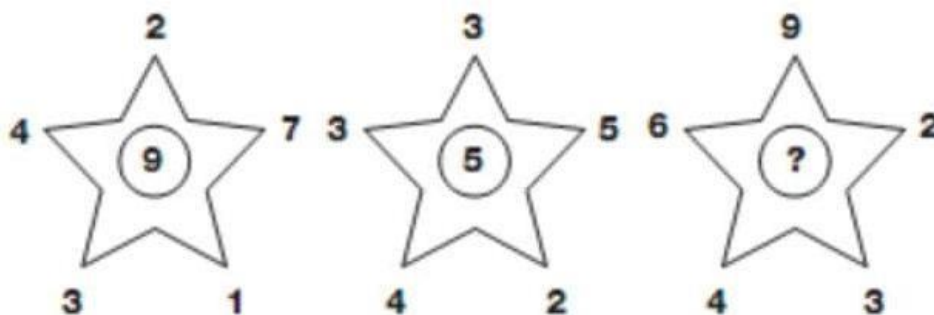
Ans: 40

2. *Which number replaces the ? mark.....*



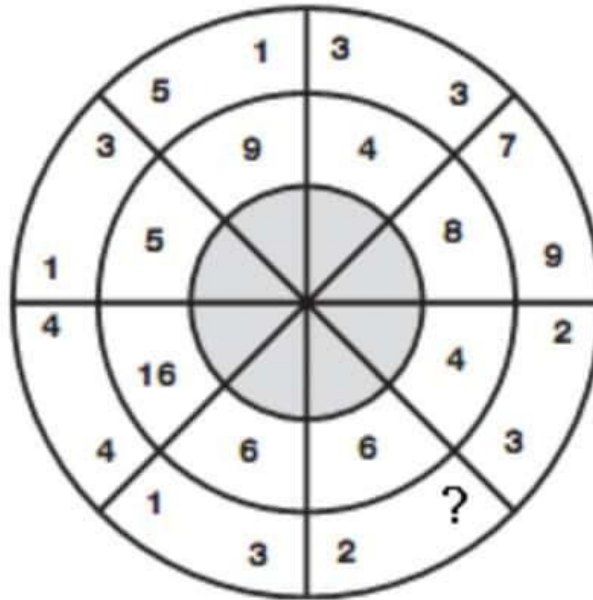
Ans: 40

3. *Which number replaces the ? mark.....*



Ans: 10

4. Which number replaces the ? mark.....



Ans: 7

5. Which replaces the ? mark.....

| | | |
|----|---|----|
| 9 | L | 6 |
| 3 | S | 5 |
| 11 | G | 9 |
| 4 | J | 13 |
| 3 | ? | 8 |

Ans: P

by

A.L.N.R.Sriram
16MH1A04D0

PROJECT IDEA

ANTI HARRASEMENT DEVICE

OBJECTIVE:

To create a safety environment for women

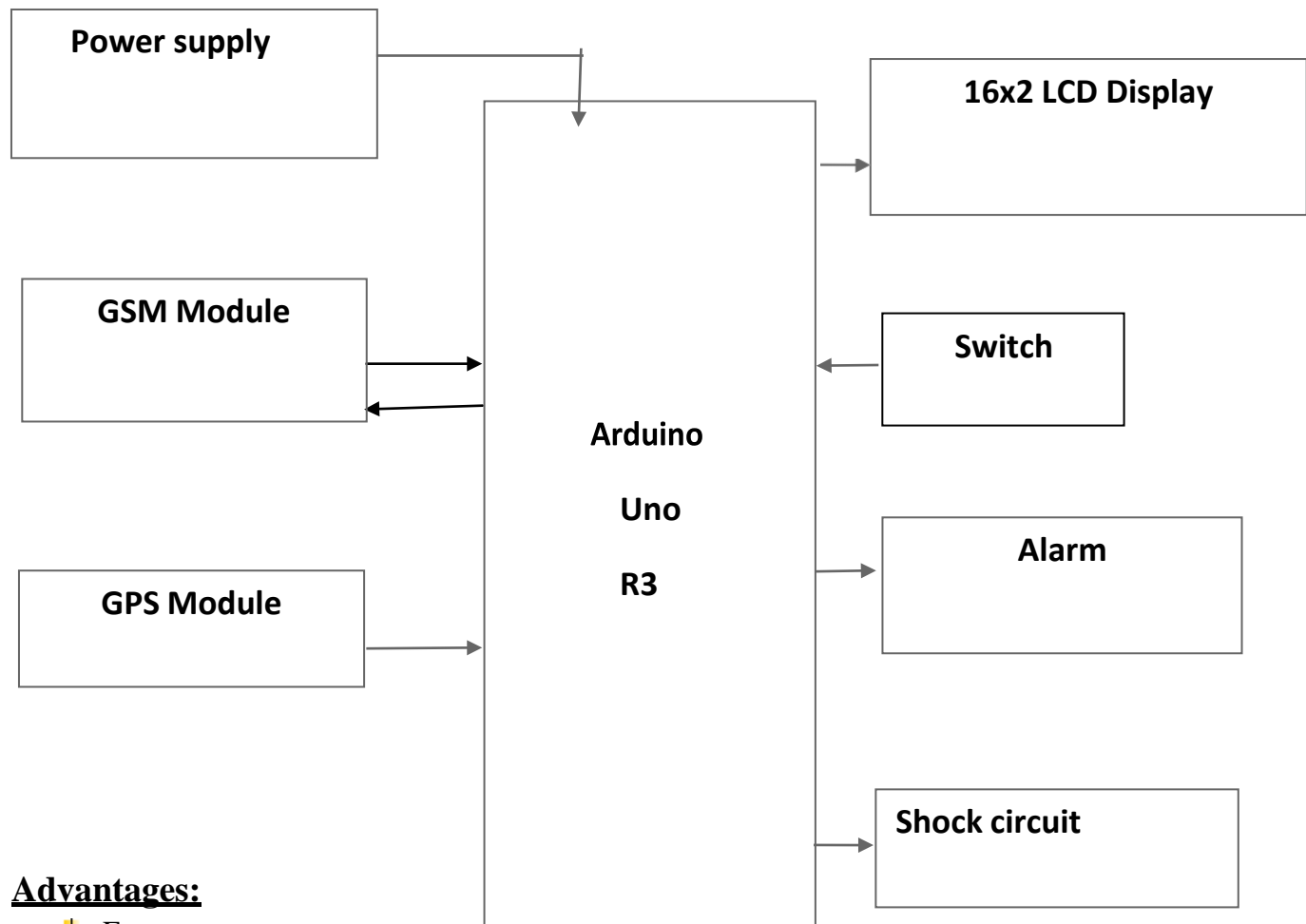
ABSTRACT:

Today in current global scenario, the prime question in every girl's mind taking into account the ever rising increase of issues on women harassment in recent past, is only about her safety and security. The only thought haunting every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security. This paper suggests a new perspective to use technology to protect women. The system resembles a normal clothes which when activated, tracks the location of the victim using GPS(Global positioning system) and sends emergency messages using GSM(Global system for mobile communication), to three emergency contacts and the police control room. The system also incorporates a screaming alarm that uses real time clock, to call out for help and also generates an electric shock to injure the attacker for self defense.

DESCRIPTION OF THE INNOVATION:

The design is implemented using an embedded microcontroller, in a modular form to be adaptable to different types of location tracking. Based on the total design of the system, the hardware and software of the system is a real-time monitoring of the women's body condition and location details in order to provide immediate help. The lady can protect herself by pressing the switch thereby it produces the electric shock and helps to deter the person harassing her. The software is developed in embedded C language to demonstrate the system capability in providing real-time response. Using the location information supplied by this system, the location is traceable using GPS through Google Map.

If switch 1 is pressed it obtains location information from the GPS and prepares a text SMS containing the present location information and sends SMS through GSM modem to the pre-programmed mobile number. Once the message is sent to the pre-defined number it displays -sent instruction in the LCD, and if it's not send then it displays -error instruction in the LCD. Similarly if switch 2 is found to be pressed, it activates the buzzer to make loud shouting sound to catch the attention of the nearby people for help. It also prepares the high voltage electric shock circuit to be ready to give a non-lethal shock to the attacker. On the other case if any of the parameter values are abnormal or any variation is detected, then also it obtains location information from the GPS and prepares a text SMS containing the present location information and sends it to the predefined number or pre-programmed mobile number.

Block diagram**Advantages:**

- ✚ Easy to operate
- ✚ Sophisticated security
- ✚ Simple and Reliable Design
- ✚ Isolates both GSM and GPS signal
- ✚ Very helpful in critical conditions

Applications:

- ✚ Automotives
- ✚ Logistics
- ✚ Personal Cars
- ✚ Public Transportation Vehicles
- ✚ Trains and Locomotives

by
BODDUJAGADISH
16MH1A0407,
III ECE-A

FACULTY ARTICLE

Multiplication Tables - Vedic Indian Math Tricks

10th to 99th....., any table....., *very easy method to learn*. I didn't know this. Because it was not taught to us in school.

How to write Table of any two digit number? For example Table of *87*

First write down *table of 8 then write down table of 7 beside it*

| | | | |
|----|----|--------|-----|
| 8 | 7 | | 87 |
| 16 | 14 | (16+1) | 174 |
| 24 | 21 | (24+2) | 261 |
| 32 | 28 | (32+2) | 348 |
| 40 | 35 | (40+3) | 435 |
| 48 | 42 | (48+4) | 522 |
| 56 | 49 | (56+4) | 609 |
| 64 | 56 | (64+5) | 696 |
| 72 | 63 | (72+6) | 783 |
| 80 | 70 | (80+7) | 870 |

Now table of 38

| | | | |
|----|----|--------|-----|
| 3 | 8 | | 38 |
| 6 | 16 | (6+1) | 76 |
| 9 | 24 | (9+2) | 114 |
| 12 | 32 | (12+3) | 152 |
| 15 | 40 | (15+4) | 190 |
| 18 | 48 | (18+4) | 228 |
| 21 | 56 | (21+5) | 266 |
| 24 | 64 | (24+6) | 304 |
| 27 | 72 | (27+7) | 342 |
| 30 | 80 | (30+8) | 380 |
| 33 | 88 | (33+8) | 418 |
| 36 | 96 | (36+9) | 456 |

Now table of 92

| | | | |
|-----|----|---------|------|
| 9 | 2 | | 92 |
| 18 | 4 | | 184 |
| 27 | 6 | | 276 |
| 36 | 8 | | 368 |
| 45 | 10 | (45+1) | 460 |
| 54 | 12 | (54+1) | 552 |
| 63 | 14 | (63+1) | 644 |
| 72 | 16 | (72+1) | 736 |
| 81 | 18 | (81+1) | 828 |
| 90 | 20 | (90+2) | 920 |
| 99 | 22 | (99+1) | 1012 |
| 108 | 24 | (108+2) | 1104 |

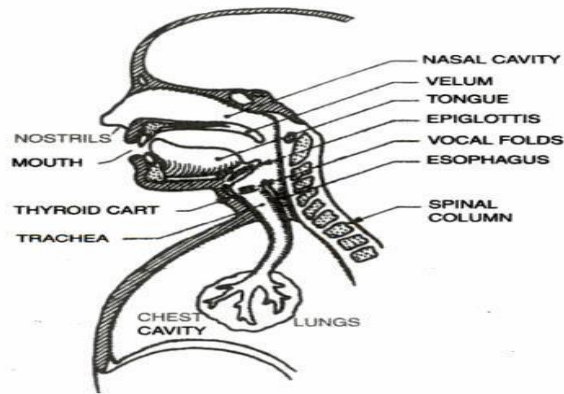
This way one can make Tables from 10 to 99

by
T.Srinivas,
Sr.Asst. Prof, ECE Dept

SPEECH PRODUCTION

The given schematic diagram shows the human vocal mechanism. The vocal ends at the lips and starts at the gap of the vocal cords. It consists of the pharynx and the mouth (or) oral cavity.

The total length of the vocal tract on average is 17cm for male and the vocal tract cross sectional area is determined by the positions of the lips, tongue, velum and jaw varies from 0 to 20 cm². The nasal tract starts at the velum and ending at the nostrils. When the velum is lowered, the nasal tract is acoustically joined to the vocal tract to generate the nasal sounds of speech.



Human vocal mechanism

During the usual breathing mechanism air enters into the lungs. As air from the lungs through the trachea is expelled, the tensed vocal cords in the larynx are happened to vibrate by the flow of air. The air flow is chopped into quasi periodic pulses which are then frequency modulated in passing through the pharynx, the mouth cavity and the nasal cavity. Different sounds are shaped based on the various articulators.

SPEECH ENHANCEMENT

The word Speech Enhancement is referred to as to get better quality (or) intelligibility of speech signal. Degraded Speech signal is often due to additive background noise like, train noise, restaurant noise, street, train station noise, airport and babble noise etc. In such noisy surroundings listening is very difficult for the end user. In many applications like PC based speech recognition system speech enhancements are used for pre-processing of speech.

There are different types of speech enhancement techniques which are as follows.

- a. Spectral Subtraction Method
- b. Weiner Filtering
- c. Minimum Mean Square Error
- d. Decision Directed Approach

These are all single channel techniques. Multi channel speech enhancement technique like adaptive noise cancellation with Least Mean Square algorithm and its family like Normalised LMS, Variable step-size LMS, Sign-regressor LMS to reduce background additive noise. The performance of least mean square algorithm and its family is evaluated by objective speech quality measure like, Signal to Noise Ratio (SNR), Mean Square Error(MSE), The least squared error (LSE), the Mean Absolute Error (MAE), Weighted Least square error (WLS), Perceptual evaluation of speech quality (PESQ), Time of computation. From articles on speech enhancement it is concluded that the performance of LMS algorithm better than other above said algorithm. So LMS algorithm and its family are widely used in communication systems because of its simplicity.

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