TULSIRAMJIGAIKWAD-PATILCollegeofEngineeringandTechnology
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to RTM Nagpur University)

Department of Electrical Engineering

Activity Based Learning
Course: BEE2305: DC Machines & Transformer

Activity: 2– *Investigates motors and electromagnets as they construct their own simple electric motors using batteries, magnets, paperclips and wire.*

Sr. No.	Activity	Level
	 ***Motors are used in an unlimited number of everyday devices designed by engineers. Engineers must fully understand and apply the connection between electricity and magnetism as they design and build motors, or design better and more efficient motors.*** **Learning Objectives** **After this activity, students should be able to:** • **Create a simple motor.** • **Describe how a motor uses an electromagnet and magnetic forces to work.** • **Explain that motors are designed by engineers for use in various applications.** **List of Materials Require** **Each group needs:** • **1 D-cell battery** • **1 wide rubber band** • **2 large paperclips (metal, with no coating)** • **1 rectangular-shaped ceramic magnet (available large hardware stores such as Home Depot)** • **43.5 in (111 cm) medium-gauge magnet wire; magnet wire is copper wire insulated with a polymer-based film, or red enamel, not plastic; available at large hardware or electronics stores such as Radio Shack** **For the entire class to share:** • **fine sandpaper** • **needle-nose pliers or wire cutters** • **(optional) a few compasses** • **thread**	**Basic**

Introduction/Motivation:-

Today we are going to learn a little bit about how motors work. Engineers design motors for many different uses. Motors take electrical energy, and convert it into mechanical or moving energy. Basically, motors take the electrical energy from an electricity source, such as an outlet or battery, and change that energy into something that spins, moves or does some sort of work. We interact with all sorts of motors every day. Can anyone think of some different items that have motors?

Have you ever felt the force pushing or pulling between two magnets? What happens when you put two magnets next to each other? Sometimes they stick together quickly and sometimes they push each other away. Sometimes, the magnets actually move around and then stick together. When two magnets pull together, it is because one magnet wants to align its south pole (S) with the north pole (N) of another magnet. Engineers use this magnetic force to get motors to work. Do you knows the difference between an electromagnet and a permanent magnet? Well, one difference is that the magnetic field of an electromagnet can be turned on and off by turning on or off the source of electricity to the coiled wire. Many of the magnets used in machines are actually electromagnets rather than permanent magnets. However, even though we call them "permanent," permanent magnets are not really permanent either. They can be de-magnetized by hitting them with a hammer or heating them up.

The motor that we are going to build today has three parts: a permanent magnet, a coil of wire and a battery. Something that is really important to remember is that when electricity moves through a wire, it turns the wire into an electromagnet. So, our wire coil is going to eventually act like another magnet (when we run current from the battery through it). Our simple motor will really have two magnets, and they are going to work together to create movement by pushing and pulling on each other. Building motors can be kind of tricky, and engineers must learn a lot about magnetism and electricity to get them to work. Let's get started!

Student Instructions Handout

Part 1: Making the Motor

1. Start about 1.5 in (38 mm) from the end of the wire and wrap it seven times around the short side of a rectangular magnet. Gently slide out the magnet, careful to not alter the rectangular shape of the wire. Leaving a 1.5 in (38 mm) tail opposite the original starting point, cut the wire with wire cutters or needle-nose pliers. Carefully wrap each of the two tails around the coil (closest to that end) so that the coil is securely bound together, and the two tails extend perpendicular to the coil. Your coil should look similar to Figure 1. Note: Be sure that the tails are opposite each other on the coil.

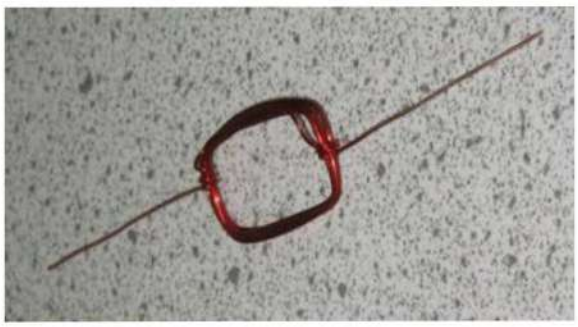

Figure 1. Magnet wire coil.

2. On one tail, use sandpaper to remove the insulation completely from the end of the tail up to ¼ in (6 mm) from the point at which the tail meets the coil. This tail should look like the left tail in the wire cross section in Figure 2. On the other tail - again leaving a ¼ in (6 mm) section of wire at the point of connection with the coil - lay the coil flat and carefully sand off the insulation from the top half of the wire. This tail should look like the right tail shown in Figure 2.

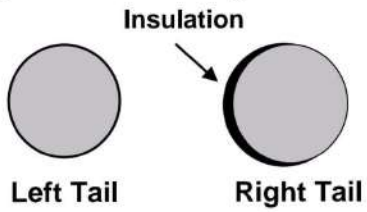

Figure 2. Cross section (or side view) of wire.


Figure 3. The bent paperclips.

3. Bend the two paper clips to look like those in Figure 3. Use needle-nosed pliers if necessary.
4. To ensure good contact at the battery terminals, sand the paper clips lightly on the surfaces that will touch the battery and the surfaces that the coil will rest on.
5. Use a rubber band to secure the large loop ends of each paper clip to the terminals of the D-cell battery. The battery, rubber band and paper clips device should look like Figure 4.


Figure 4. Use a rubber band to secure the paperclips to the battery.

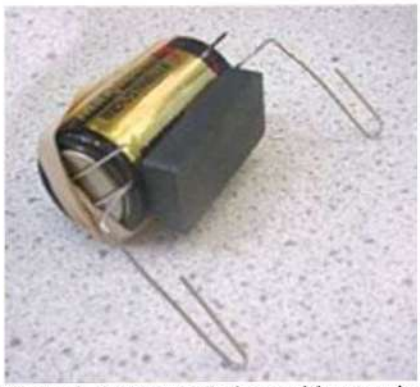
Figure 5. Battery end view, with ceramic magnet in place.

6. Place a ceramic magnet on the side of the battery (it will "stick" to the battery) as shown in Figures 5.
7. Place the coiled wire with tails into the small loops formed by the unattached ends of the paper clips ("cradles"). Your motor should look like the one in Figure 6.

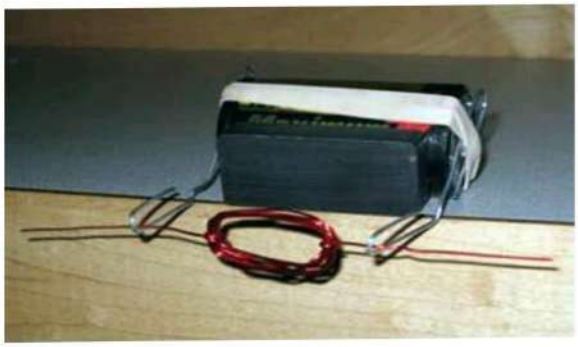
Figure 6. The complete motor setup.

8. Turn the coil slowly by hand (only touch the insulated part of the wire) and observe the magnetic attraction and repulsion between the electromagnet and the ceramic magnet.
9. (Optional) Remove the magnet from the battery. Use a compass to determine the orientation of the magnetic field of the coil. Remove the coil and replace it on the paper clips in the opposite direction. Use the compass to determine the orientation of magnetic field of the coil again.

Part 2: Making the Motor Do Work

1. Position the motor on the edge of a table or countertop (see Figure 6).
2. Bend the end of the wire that has the insulation completely removed into a very small, tight loop.
3. Tie one end of a one-foot (.3 m) long piece of thread around this loop. Tie the other end around a small paper clip.
4. Give the coil a little push to get it to start winding up the string. Once the extra loop and string are added, it may throw the motor off balance. Getting the motor to wrap the string correctly takes a significant bit of tweaking, but it will work. Use your finger as a guide.
5. Once the motor picks up one paper clip, unwind it and try connecting a second paper clip to the first. Keep adding paper clips and trying again until the motor is no longer able to lift the load. We were able to lift 16 paper clips with just this motor, so it *is* possible!

Usefull Links
https://www.youtube.com/watch?v=KsxMXVPicv0

Course Coordinator

HoD, EE
Department of Electrical Engineering
Tulsiramji Gaikwad Patil College of Engineering & Technology, Nagpur

Rubrics for Activity 2: *Investigates motors and electromagnets as they construct their own simple electric motors using batteries, magnets, paperclips and wire.*

Particulars	Poor	Good	Very Good	Satisfactory	Excellent	Total marks (Max. marks)
Marks	0 marks	0.5 mark	1 mark	1.5 mark	2 marks	2 marks
Knowledge of terms related to Activity	student don't have knowledge of all terms used in activity	student have knowledge of 1 term used in activity	student have knowledge of 2 terms used in activity	student have knowledge of 3-4 terms used in activity	student have knowledge of all terms used in activity	2 marks
Knowledge of instruments/ devices related to Activity	Students don't know about any instrument/device used in activity	Students know about only 1 instrument/device used in activity	Students know about only 2 instruments/devices used in activity	Students know about only 3 or 4 instruments/devices used in activity	Students know about all instruments/devices used in activity	2 marks
Ability to form/ construct Parts as per requirement	Not able to form/ construct Parts as per requirement	Able to form/ construct Parts as per requirement with only 1 right Parts	Able to form/ construct Parts as per requirement with only 2 right Parts	Able to form/ construct Parts as per requirement with maximum right parts	Able to form/ construct Parts as per requirement with all right connections	2 marks
Ability to make connections of required Activity	Don't able **to make connections of required Activity**	Able to make connections of required Activity with any 1 connection of model	Able to make connections of required Activity with any 2 connection of model	Able to make connection of model with any 3 connections connection of model	Able to make connection of model all the connection of model	2 marks
Accuracy of complete activity	Degree of accuracy is poor in all respect	Degree of accuracy is very low in all respect	Degree of accuracy is low in all respect	Degree of accuracy is moderate in all respect	Degree of accuracy is high in all respect	2 marks
Total marks						**10 marks**

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Department of Electrical Engineering

Activity Based Learning
Course: BEE2305: DC Machines & Transformer

Activity: 1 – *Student teams investigate the properties of electromagnets*

They create their own small electromagnets and experiment with ways to change their strength to pick up more paperclips. Students learn about ways that engineers use electromagnets in everyday applications.

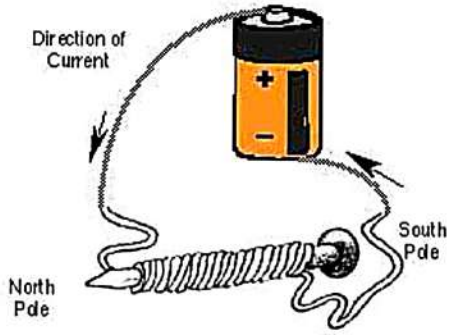

Figure 1. A basic electromagnet.

Engineering Connection

Engineers design electromagnets, which are a basic part of motors. Electromagnetic motors are a big part of everyday life, as well as industries and factories. We may not even realize that we interact with electromagnets on a daily basis as we use a wide variety of motors to make our lives easier. Common devices that use electromagnetic motors are: refrigerators, clothes dryers, washing machines, dishwashers, vacuum cleaners, sewing machines, garbage disposals, doorbells, computers, computer printers, clocks, fans, car starters, windshield wiper motors, electric toothbrushes, electric razors, can openers, speakers, music or tape players, etc.

Learning Objectives

After this activity, students should be able to:

- *Relate that electric current creates a magnetic field.*
- *Describe how an electromagnet is made.*
- *Investigate ways to change the strength of an electromagnet.*
- *List several items that engineers have designed using electromagnets.*

Each group needs:

- nail, 3-inch (7.6 cm) or longer (made of zinc, iron or steel, but not aluminum)
- 2 feet (.6 m) insulated copper wire (at least AWG 22 or higher)
- D-cell battery
- several metal paperclips, tacks or pins
- wide rubber band
-

For each electromagnetic field station:

- cardboard toilet paper tube
- insulated copper wire (at least AWG 22 or higher), several feet (1 m)
- cardboard (~ 5 x 5 inches or 13 x 13 cm)
- clothespins or clamps (optional)
- masking tape
- rubber band
- 2-3 D-cell batteries
- 9-V (volt) battery
- several metal paperclips, tacks and/or pins
- extra batteries, if available: 6-V, 12-V, lantern batteries
- (optional) electrical tape
- 2 small orienteering compasses

For the entire class to share:

- wire cutters
- wire strippers

Pre-Req Knowledge

- Some knowledge of magnetic forces (poles, attraction forces).

Procedure

Before the Activity

- Gather materials and make copies of the Building an Electromagnet Worksheet.
- Set up enough Electromagnetic Field Stations to accommodate teams of two students each.
- As an alternative, conduct both parts of the activity as teacher-led class demonstrations.

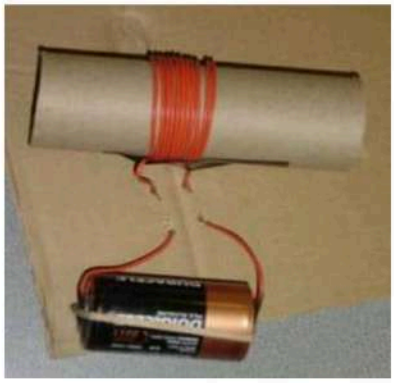

Figure 2. Setup for an Electromagnetic Field Station.

1) Prepare for Electromagnetic Field Stations: Wrap wire around a cardboard toilet paper tube 12-15 times to make a wire loop. Leave two long tails of wire hanging from the coil. Poke four holes in the cardboard. Weave the wire ends through the cardboard holes so that the card board tube and coil are attached to the cardboard (see Figure 2). Use clothespins, clamps or tape to secure the cardboard to a table or desk. Using masking tape or rubber band, connect one end of the coil wire to any battery, leaving the other end of the wire not connected to the battery. Place some pins, paperclips or tacks at the station. Also, place any other available extra batteries (6V, 12V, etc.) and two, small orienteering compasses at this station.
2) Prepare for Building an Electromagnet: For this portion of the activity, either set up the materials at a station, or give them to pairs of students to work on at their desks.
3) Set aside a few extra batteries for students to test their own electromagnets. These might include the 9-V batteries. You can make a 3-V battery setup by connecting 2 D-cells in series or a 4.5-V battery setup by connecting 3 D-cells in series.
4) Cut one 2-ft (.6 m) piece of wire for each team. Using wire strippers, remove about ½ inch (1.3 cm) of insulation from both ends of each piece of wire.

With the Students: Electromagnetic Field Stations

- Divide the class into pairs of students. Hand out one worksheet per team.
- Working from the pre-activity setup (see Figure 2), in which one end of the coiled wire is attached to one end of the battery, have students connect the other end of the wire to the other end of the battery using tape or rubber band.
- To locate the magnetic field of the electromagnet, direct students to move the compass in a circle around the electromagnet, paying attention to the direction that the compass points (see Figure 3). Direct students to draw the battery, coil and magnetic field on their worksheets. Use arrows to show the magnetic field. Label the positive and negative ends of the battery and the poles of the magnetic field. What happens if you dangle a paperclip from another paperclip near the coil (see Figure 3)? (Answer: The dangling paperclip moves, changes direction and/or wobbles.)

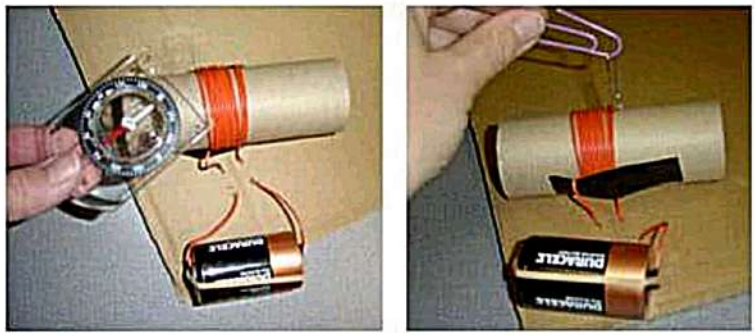

Figure 3. Experimenting with the magnetic field of the electromagnet.

- Next, reverse the connection of the electromagnet by changing both ends of the wire to the opposite ends of the battery. (When the direction of current is reversed in either a coil or electromagnet, the magnetic poles reverse—the north pole becomes the south pole, and the south pole becomes the north pole.) Use the compass to check the direction of the magnetic field. Make a second drawing. Dangle the paperclip near the coil again. What happens? (Answer: Again, the dangling paperclip moves, changes direction and/or wobbles.)
- Remove at least one end of the wire from the battery to conserve battery power.
- If time permits, use different batteries and observe any changes. A higher voltage translates to a greater current, and with more current, the electromagnet becomes stronger.

With the Students: Building an Electromagnet

1. Make sure each student pair has the following materials: 1 nail, 2 feet (.6 m) of insulated wire, 1 D-cell battery, several paperclips (or tacks or pins) and a rubber band.
2. Wrap the wire around a nail at least 20 times (see Figure 4). Ensure students wrap their nails tightly, leaving no gaps between the wires and not overlapping the wraps.
3. Give the students several minutes to see if they can create an electromagnet on their own before giving them the rest of the instructions.
4. To continue making the electromagnet, connect the ends of the coiled wire to each end of the battery using the rubber band to hold the wires in place (see Figure 4).

Figure 4. Setup to make an electromagnet using a battery, wire and nail.

5. Test the strength of the electromagnet by seeing how many paperclips it can pick up.

6. Record the number of paperclips on the worksheet.
7. Disconnect the wire from the battery after testing the electromagnet. Can the electromagnet pick up paperclips when the current is disconnected? (Answer: No)
8. Test how varying the design of the electromagnet affects its strength. The two variables to modify are the number of coils around the nail and the current in the coiled wire by using a different size or number of batteries. To conserve the battery's power, remember to disconnect the wire from the battery after each test.
9. Complete the worksheet; making a list of ways engineers might be able to use electromagnets.
10. Conclude by holding a class discussion. Compare results among teams. Ask students the post-assessment engineering discussion questions provided in the Assessment section.

Course Coordinator

HoD, EE.

Department of Electrical Engineering
Rajiramji Gaikwad Patil College of
Engineering & Technology, Nagpur

Rubrics for Activity 1: ***Student teams investigate the properties of electromagnets***

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Department of Electrical Engineering
Course: BEELE302T – Non Conventional Energy Sources

RTM Nagpur University Syllabus

Unit – I: Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.

Unit – II: Solar Energy Collectors: Physical Principles of the conversion of solar radiation into heat, flat plate collectors, transitivity of cover systems, energy balance equation and collector efficiency, concentrating collectors, comparison of concentrating and flat plate collectors, selective absorber coatings.
Solar Energy Storage: Solar Energy Storage system (Thermal, Electrical, Chemical, Mechanical), Solar ponds.

Unit – III: Application of Solar Energy: Solar water heating, space heating, space cooling, solar thermal heat conversion, solar photovoltaic energy conversion, solar pumping, solar cooking, online grid connected solar photovoltaic generation system.

Unit – IV: WIND ENERGY: Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy.

Unit V: ENERGY from OCEANS: Ocean thermal electric conversation (OTEC), Claude & Anderson cycles, evaporators, Bio-fouling, Hybrid cycle, components of OTEC for power generation.

ENERGY from OCEANS: Ocean thermal electric conversation (OTEC), Claude & Anderson cycles, evaporators, Bio-fouling, Hybrid cycle, components of OTEC for power generation.

Unit – VI : **OTHER NONCONVENTIONAI, ENERGY SOURCE:** Brief Introduction to operating principles only): small scale hydro electric power generation, Energy from Bio – Mass, Geothermal Energy, MHD power generation, fuel cell etc.

Department of Electrical Engineering
Course: BEELE302T – Non Conventional Energy Sources

Planning of the Content Delivery Based on the Course Module

I. Framing the Course Outcomes (BEELE302T) – Non Conventional Energy Sources, based on the 4,5,6 Level of the Blooms Taxonomy

At the end of the course, learners will be able to

BEELE302T.1	Evaluate the complex calculations related to Solar Radiation Geometry and Select the correct instrument for the measurement of Solar Radiation
BEELE302T.2	Classify the various Solar Energy Collectors and Differentiate between the Solar Energy Storage
BEELE302T.3	Organize the various applications of Solar Energy
BEELE302T.4	Decide the location for the installation of the Wind Energy Conversion System
BEELE302T.5	Recognize the potential of the generation of electricity from Ocean Thermal Energy Conversion (OTEC) and Tidal and Wave Energy
BEELE302T.6	Express the working of the various Non-Conventional Energy Sources

II. Framing the Learning Outcomes (LO) based on the topics in the respective units of the course.

For Example:

BEELE302T.1 is further subdivided in three topics based on the contents of the syllabus as given by the University.

Topic # 1	**Solar Constant, Solar radiation at earth's surface**
Topic # 2	**Solar Radiation Geometry**
Topic # 3	**Solar Radiation Measurement**

Based on the Topics of the Unit the content delivery will be done with the specific Learning Outcomes from each topic:

II. Learning Outcomes from the Topics:

BEELE302T.1 # Topic 1: At the end of the topic, the learners shall be able to –

1. **Justify** the type of Solar Radiation incident on the surface of the earth.
2. **Differentiate** between beam and diffused radiation.
3. **Correlate** the different wavelength of the radiation for the energy extraction.
4. **Estimate** the solar constant on the surface of the earth.

5. **Interpret** the role of solar energy for the existence of the earth.

BEELE302T.1 # Topic 2: At the end of the topic, the learners shall be able to –

1. **Evaluate** the incidence angle, declination angle, azimuth angle of the site.
2. **Predict** the tilt angle based upon the latitude of the location.
3. **Recommend** the orientation based on the zenith and altitude angle of the site.
4. **Formulate** the Hour angle and day length of the site.
5. **Solve** the complex problems related to solar radiation geometry

BEELE302T.1 # Topic 3: At the end of the topic, the learners shall be able to –

1. **Summarize** the devices used for the measurement of solar radiation.
2. **Explain** the construction and working of the various devices used in the solar radiation measurement.
3. **Differentiate** the various solar measurement devices based on the applications
4. **Recommend** the proper device for measuring the different types of radiation.
5. **Justify** the usage of modern tools in context of the site installation.

III. Gap Analysis based on the Course Outcomes mapping with the Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	2	3	-	-	2	-	1	-	-
CO2	3	1	3	-	1	2	1	3	1	-	-	2	2	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	1	3
CO4	3	3	3	2	1	-	-	3	3	-	3	2	2	2
CO5	3	3	3	2	-	-	-	-	-	-	-	2	2	3
CO6	3	3	2	1	1	-	2	3	-	1	-	2	2	3
Average	**3**	**2.33**	**2.83**	**1.5**	**0.83**	**0.67**	**1**	**1.5**	**0.67**	**0.5**	**0.5**	**1.83**	**1.5**	**2.33**

Summary of the Gap Analysis:

1. PO – 5, 6, 7, 9, 10, 11 is moderately or Poorly Mapped with the Course Outcomes of the Course, remedial measures needs to be identified for the attainment of the above mentioned PO's.
2. Co – Curricular activity needs to be arranged to overcome the gaps in the CO-PO-PSO Mapping
3. Game – Pedagogy needs to be implemented to meet the PO-9
4. Project Based learning case studies will be done to overcome the Gap in PO-10, 11
5. Industry Expert Webinar and virtual industrial tour will be organized to meet the PO – 5, 6, and 7

Department of Electrical Engineering
Course: BEELE302T – Non Conventional Energy Sources

Execution of the Content Delivery to meet the Course Outcome:

I. Teaching Plan for the specific purpose of the attainment of the Learning Outcomes:

Lec. No	Topic of the Lecture	Expected Date	Actual Date
BEELE302T.1 Topic # 1: Solar Constant, Solar Radiation at earth's surface			
1	Solar Radiation and its Type	**01/07/2020**	**01/07/2020**
2	Solar Constant	**02/07/2020**	**02/07/2020**
BEELE302T.1 Topic # 2: Solar Radiation Geometry			
1	Angle of Incidence, Angle of Tilt	**03/07/2020**	**03/07/2020**
2	Latitude Angle, Declination Angle	**04/07/2020**	**04/07/2020**
3	Calculation of Declination Angle with some examples	**06/07/2020**	**06/07/2020**
4	Hour Angle, Azimuth Angle, Zenith Angle, Altitude Angle	**07/07/2020**	**07/07/2020**
5	Complex Calculations with few examples	**08/07/2020**	**08/07/2020**
6	Summarize all the angles and their importance in the Solar Radiation Geometry	**09/07/2020**	**09/07/2020**
BEELE302T.1 Topic # 3: Solar Radiation Measurement Instruments			
1	Different Instruments used for Solar Radiation, their characteristics	**10/07/2020**	**10/07/2020**
2	Construction and Working of Pyranometer and Pyrheliometer	**11/07/2020**	**11/07/2020**
BEELE302T.1 Topic#4 : Advanced Topic on Unit – I			
1	Schematic of Solar PV Module, I-V, P – V Curve, Effect of Solar Irradiance	**13/07/2020**	**13/07/2020**
2	Temperature gradient effect o Solar PV Module, Optimum row spacing	**14/07/2020**	**14/07/2020**
BEELE302T.1 Topic#4 : Case Study of 120 kW Roof Top Solar PV Plant of TGPCET			
1	Site Details, Generation from the plant, SLD of the Plant, Rating of the Solar PV Module used, Tilt Angle of the Module, Inverter Size	**15/07/2020**	**15/07/2020**
BEELE302T.1 Puzzle based activity to develop the Individual and Team Work			
1	Emoji based puzzle for the team building and individual assessment	**16/07/2020**	**16/07/2020**
Total Lectures Required to complete the Unit I = 14			

II. Learning Outcome Test at the end of each Topic to assess the outcomes of the topic.

Questionnaire of Learning Outcome Test of Topic # 1: (5 Marks)

Q.1) The wavelength of visible light is _____

A. 230 nm - 350 nm
B. 380 nm - 700 nm
C. 425 nm - 760 nm
D. 540 nm - 900 nm

Q.2) What is albedo?

A. Beam Radiation
B. Diffused Radiation
C. Reflected Radiation
D. None of the above

Q.3) The value of Solar Constant is _____ kW/m^2.

A. 1.367
B. 1.867
C. 1.637
D. 1.737

Q.4) Irradiance is the total quantity of radiant solar energy per unit area received over a given period.

A. True
B. False

Date of Test: 3rd July 2020
Link for the Test: https://forms.gle/7auzVVBhDwki4VyV9

Questionnaire of Learning Outcome Test of Topic # 2: (10 Marks)

Q.1) The Angle of Latitude is denoted by the symbol _____.

A. Delta
B. Theta
C. Phi
D. Omega

Q.2) Angle of Incidence does not depend on the location and the orientation of the surface.

A. True
B. False

Q.3) The angle of incidence is determined by surface azimuth angle, _____ and slope angle.

A. Azimuth angle
B. Hour angle
C. Zenith angle
D. Altitude angle

Q.4) For horizontal surface, the tilt angle is _____ degree

A. 0
B. 180
C. 210
D. 90

Q.5) For sun tracking collectors, tilt angle is changed automatically to track the sun.

A. True
B. False

Q.6) Solar power incident on the surface varies with _____ of the location of the surface.

A. Latitude
B. Altitude
C. Sea level
D. None of the above

Q.7) The choice of the tilt angle (beta) is guided by the _____ angle of the location.

A. Latitude
B. Longitude

Q.8) In order to calculate the declination angle of a place on a July 8, the value of n = _____

A. 180
B. 189
C. 190
D. 156

Q.9) The Declination angle varies between _____ to _____ throughout the year.

A. 0 degree to 180 degree
B. -23.45 degree to 23.45 degree
C. 180 degree to 360 degree
D. 35 degree to 75 degree

Q.10) The declination angle is zero on March 21 and September _____.

A. 1
B. 21
C. 19
D. 30

Date of Test: 9th July 2020

Link for the Test: https://forms.gle/1YMwWFapnWcXi2qFA

Questionnaire of Learning Outcome Test of Topic # 3: (10 Marks)

Q.1) From the given devices which is not used to measure solar radiation?

A. Pyranometer
B. Pyrheliometer
C. Sunshine Recorder
D. Anemometer

Q.2) Pyranometer measures _____ solar irradiance.

A. beam
B. diffused
C. global
D. None of the above

Q.3) In order to get the accurate data the pyranometer should be tilted to _____ degrees at the site

A. zenith angle
B. altitude angle
C. latitude angle
D. longitude angle

Q.4) If the solar radiation from the site is 1000 W/m2 and the overall efficiency of the conversion is 20%. Still the generation is not coming from the site, what may be the probable reasons?

A. Failure of the PV Module at the site
B. Failure in the inverter connections
C. Problems in the DC Cables in the site

D. Any problem as mentioned above

Q.5) Which of the components is not a part of the pyranometer?

A. One or two domes
B. Thermopile
C. Black Absorber
D. Solar Tracking System

Q.6) Pyranometer is a device that records the diffused solar radiation.

A. True
B. False

Q.7) The acceptance angle of the pyrheliometer is _____ degree.

A. 10
B. 15
C. 5
D. 20

Q.8) The tube inside the pyrheliometer is painted with _____ colour.

A. Blue
B. Black
C. Red
D. White

Q.9) The role of the alignment indicator in a pyrheliometer is to _____.

A. adjust the acceptance angle
B. track the sun in the sky
C. adjust the thermopile
D. None of the above

Q.10) If you have to measure the beam solar radiation only, which device would you choose?

A. Pyranometer
B. Pyrheliometer
C. Anemometer
D. Thermometer

Date of Test: 11th July 2020

Link for the Test: https://forms.gle/aXmfSafLQAu6L8Nz5

III. Feedback Assessment at the end of the Unit – I of the Course:

Questionnaire for the Feedback assessment:

- **Part – I:**

General Information:

A. Name of the Student : _____
B. Gender of the Student : (Female /Male)
C. Area from where the student belongs: (Urban / Rural)

- **Part – II:**

Specific Questions related to the Learning Outcomes: (Linear Scale 1 – 5)

i. **Is the instructor able to communicate with the students effectively?**
ii. **Is the instructor able to clear the doubts of the students?**
iii. **Is the instructor able to check whether the students are attentive throughout the session or not?**
iv. **Is the online mechanism helping you to get the course in right direction due to pandemic situation?**

IV: Advanced Topic related to the Unit – I :

A. **Schematic of Solar PV Module, I-V, P – V Curve, Effect of Solar Irradiance**
B. **Temperature gradient effect o Solar PV Module, Optimum row spacing**

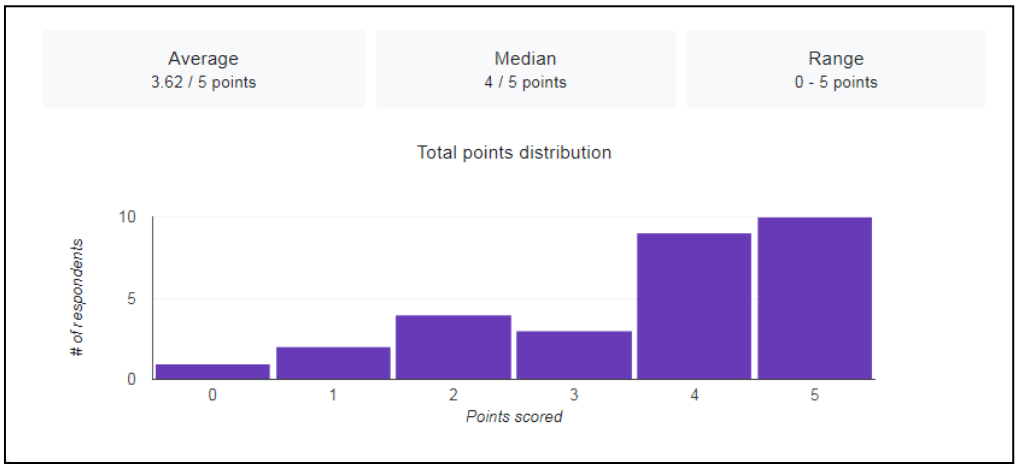
V: Case Study on 120 kW Roof Top Solar PV Power Plant of Tulsiramji Gaikwad – Patil College of Engineering and Technology, Nagpur.

VI: Puzzle Based Activity for developing the Individual and Team Work among the students.

Outcome of the Planning and Effective Implementation of the Course Module

I. Analysis of Learning Outcome Test conducted after completion of the topic in order to assess the outcomes as planned in the topic outcomes:

i. Analysis of LO Test of Topic #1:



Highlights of the Learning Outcomes Test on Topic #1of Unit -1 of BEELE302T:

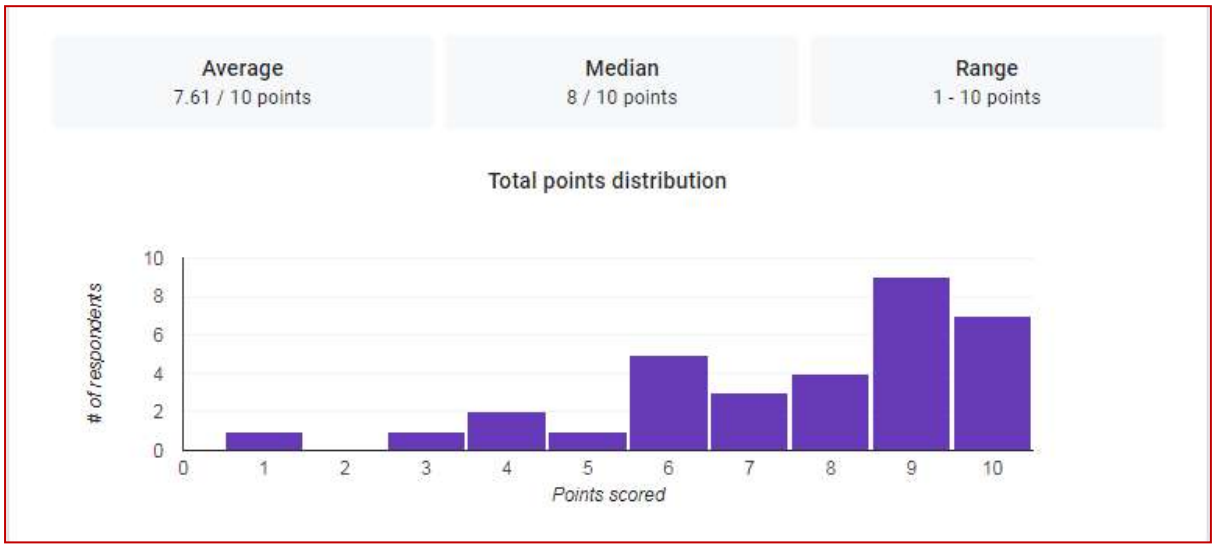
- ✓ **More than 65% of the Students were able to score above 80% of the marks.**
- ✓ **35% of students were not able to score more than 60% of marks in the test.**
- ✓ **1 student is not able to score a single marks**

No. of students Attempted test=29	
Marks obtained out of 5	**No. of Students**
5	10
4	9
3	3
2	4
1	2
0	1

Action Taken on Learning Outcomes Test on Topic #1of Unit -1 of BEELE302T:

- ✓ **Counselling of the students who have not scored more than 60% marks.**
- ✓ **Session on the fundamentals of the topic for such students to clear their doubts.**
- ✓ **Understanding the difficulty of the student who is not able score a single marks and giving remedial solutions to the student.**

ii. Analysis of LO Test of Topic #2:



Highlights of the Learning Outcomes Test on Topic #2 of Unit -1 of BEELE302T:

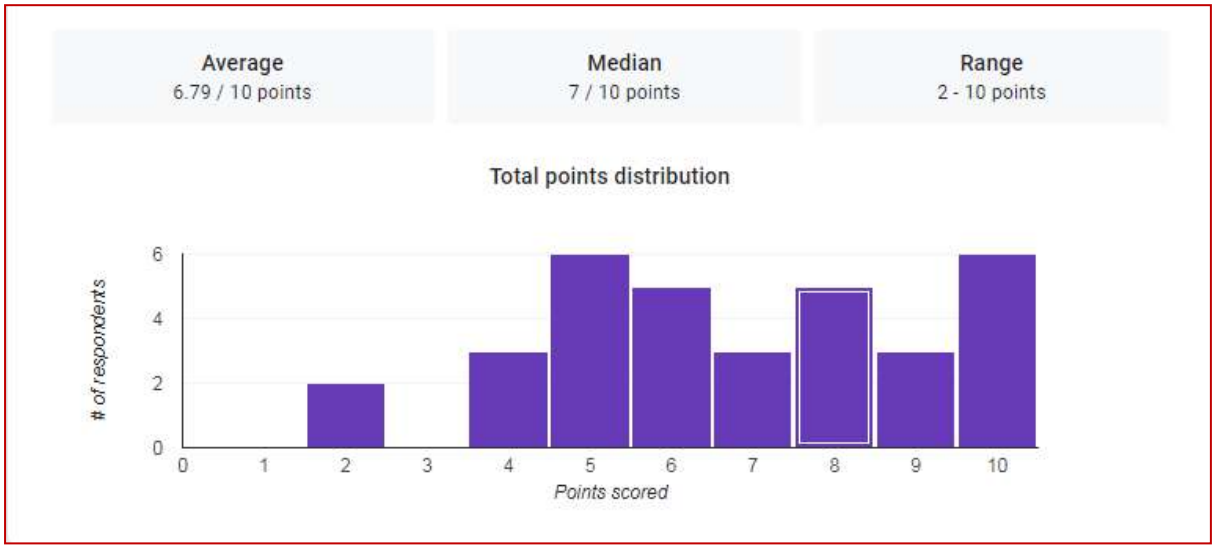
- ✓ **More than 60% of the Students were able to score above 80% of the marks.**
- ✓ **15% of students were not able to score more than 60% of marks in the test as compared to 35% in previous test, which shows improvement in the number of students.**
- ✓ **No student has scored zero in the test which shows the outcome of the counselling and remedial measures taken for the slow learners.**

No. of students Attempted test=33	
Marks obtained out of 10	**No. of Students**
10	7
9	9
8	4
7	3
6	5
5	1
4	2
3	1
2	0
1	1
0	0

Action Taken on Learning Outcomes Test on Topic #1of Unit -1 of BEELE302T:

- ✓ **Counselling of the students who have not scored more than 60% marks.**
- ✓ **Session on the fundamentals of the topic for such students to clear their doubts.**
- ✓ **Understanding the difficulty of the student who are not able score more than 60% marks in the Test.**

iii. Analysis of LO Test of Topic #3:



Highlights of the Learning Outcomes Test on Topic #3 of Unit -1 of BEELE302T:

- ✓ **More than 43% of the Students were able to score above 80% of the marks.**
- ✓ **30% of students were not able to score more than 60% of marks in the test as compared to 35% in previous in Topic- 1 test, which shows improvement in the number of students, but a slight less as compared to Topic -2 test.**
- ✓ **No student has scored zero,1 and 3 in the test which shows the outcome of the counselling and remedial measures taken for the slow learners.**

No. of students Attempted test=33	
Marks obtained out of 10	**No. of Students**
10	6
9	3
8	5
7	3
6	5
5	6
4	3
3	0
2	1
1	0
0	0

Action Taken on Learning Outcomes Test on Topic #1of Unit -1 of BEELE302T:

- ✓ **Counselling of the students who have not scored more than 60% marks.**
- ✓ **Session on the fundamentals of the topic for such students to clear their doubts.**
- ✓ **Understanding the difficulty of the student who are not able score more than 60% marks in the Test.**
- ✓ **Some identified number of students are scoring consistently more than 80 % whereas some students are not able to score more than 50% marks. Action plan for all such students is to be made to perform well in the coming units.**

Overall Analysis of the Learning Outcome Test: (Based on the Online MCQ Based Test):

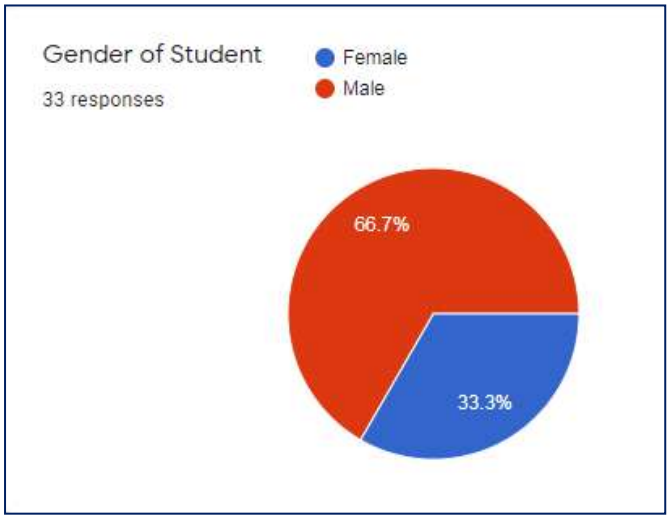
Topic No.	Average	Median	Range
Topic # 1	7.24	8	0-10
Topic # 2	7.61	8	1-10
Topic # 3	6.79	7	2-10

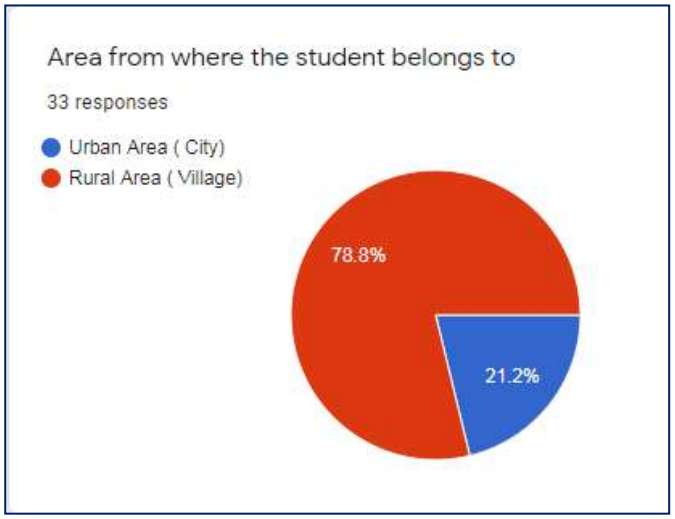
Conclusions:

- ✓ **It can be concluded that the Course Outcome which is framed for the Unit – I is achieved to a satisfactory level.**
- ✓ **However, there is still a lot of scope for the improvement in terms of the learning teaching process.**

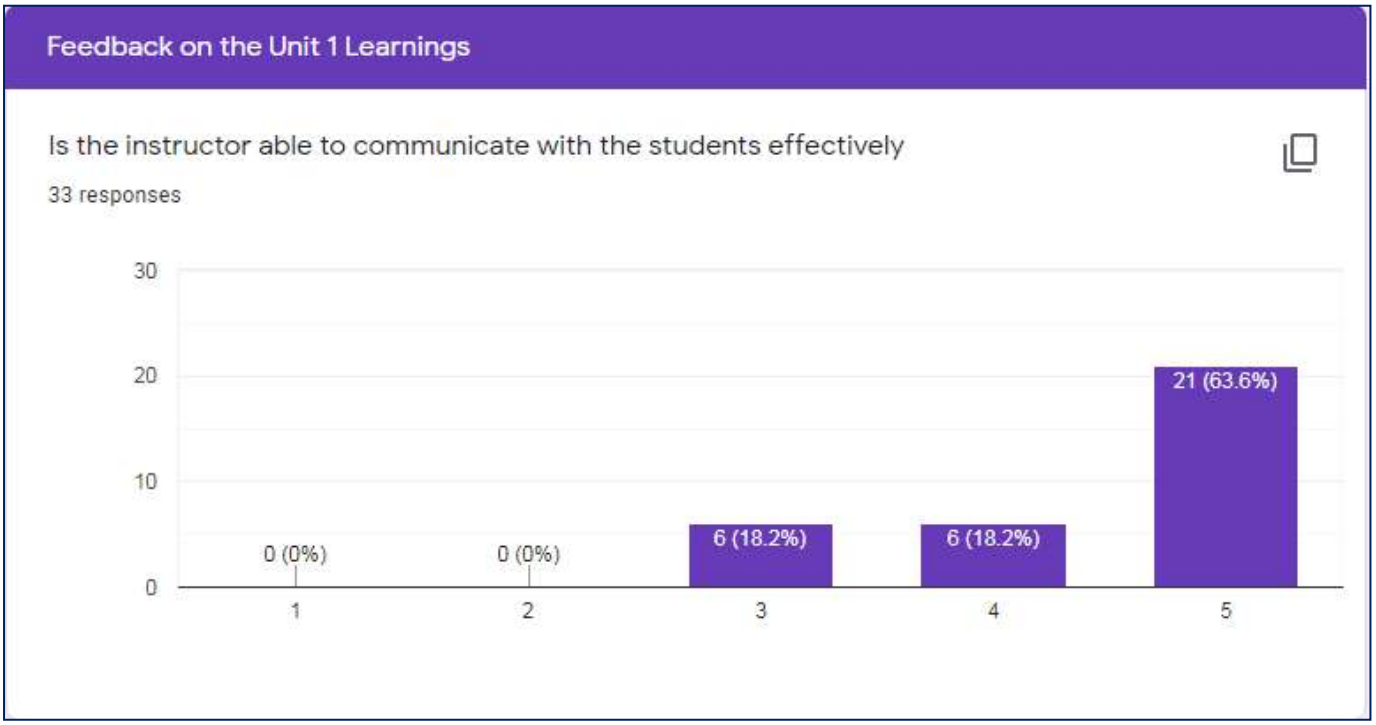
II. Analysis of the feedback of the learners towards the learning outcomes of Unit – I:

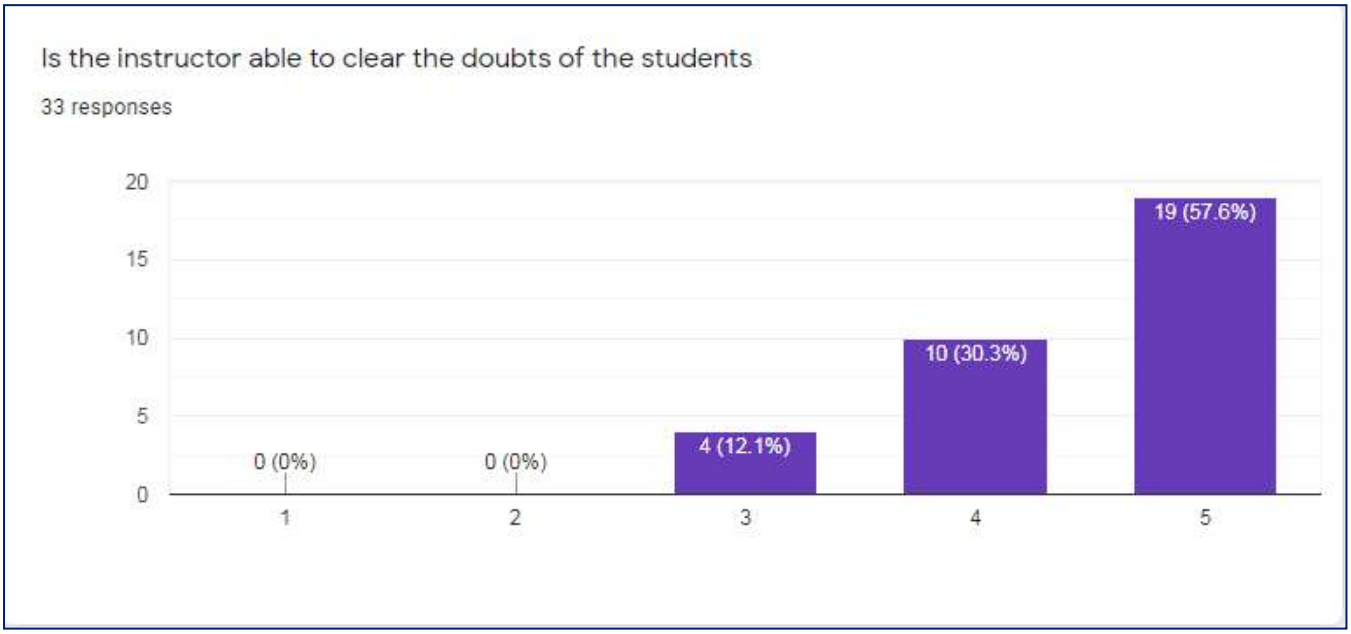
A. Part – I : General Points -





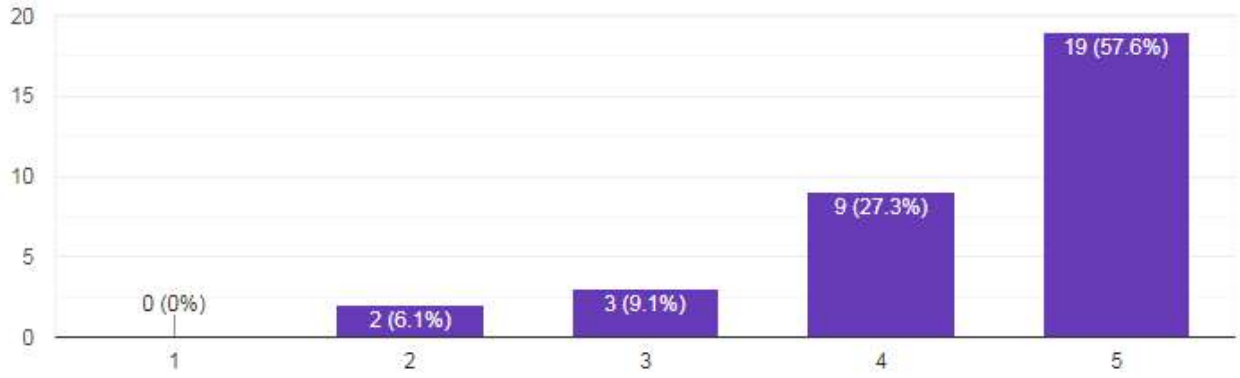
B. Part – II : Specific to the Learning Outcomes of Unit – I





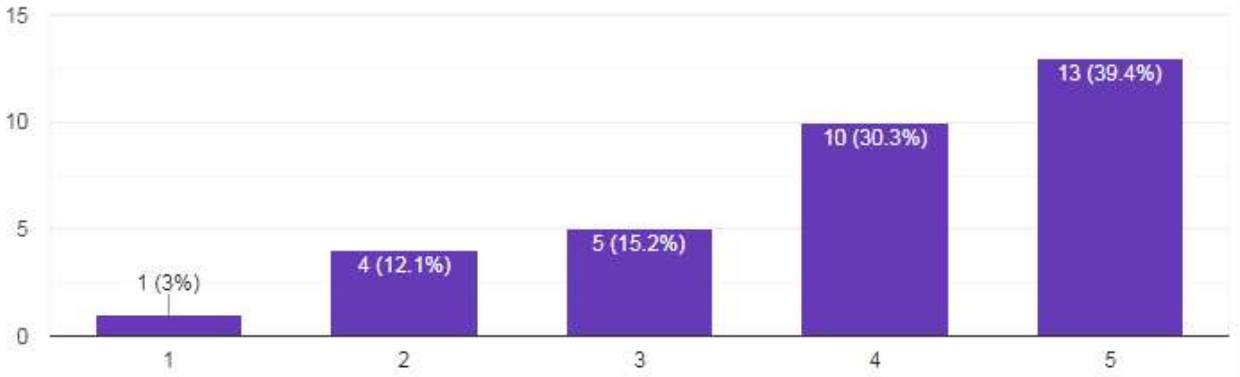
Is the instructor able to check whether the students are attentive throughout the session or not?

33 responses



Is the online mechanism helping you to get the course in right direction due to pandemic situation.

33 responses



III. Activity for assessment of Individual and Team Work:

Activity 1: To assess the individual efforts and team work with an emoji puzzle as learning outcome of Unit – I.

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The emoji based puzzle will be floated in the whatsapp group at 9.00 am in the morning.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the whatsapp group first will be declared as winner.

Problem statement of the puzzle:

The terminologies that were while learning the various topics during Unit – I will be resembled using the emoji's. There are 25 such words. Students have to identify each word, write it down one by one in the sequence as it is asked and post the solutions on specified time in the specified location.

The terminologies are as given below in the Annexure:

Course Coordinator
BEELE302T - NCES

Assessment of the Activity:

- ✓ It is found that all the group had send their answers at 10.00 am.
- ✓ No groups send the answer before 10.00 am, which shows a very good co-ordination among the team members.

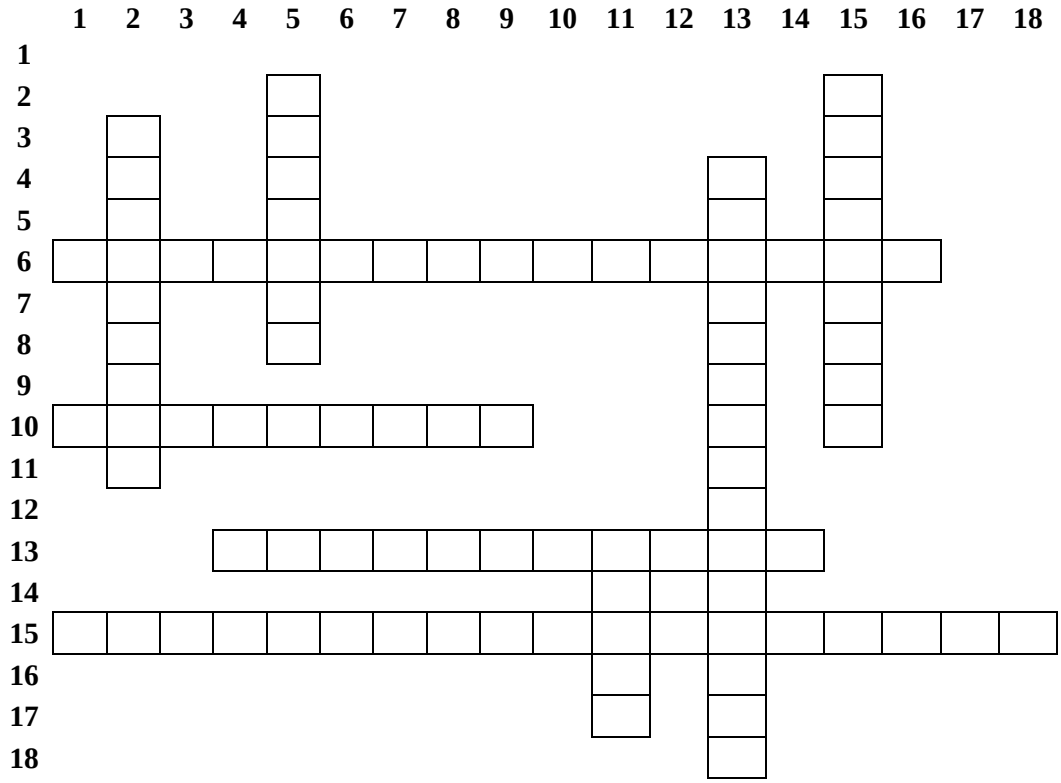
- ✓ Team members have used modern tool (conference call) to find the solution of the puzzle based activity and participated with great confidence.

SOLUTION SENT BY THE STUDENTS (GROUPS) - EMOJI BASED PUZZLE BASED ACTIVITY

Tulsiramji Gaikwad-Patil College of Engineering & Technology
Wardha Road, Nagpur-441 108
NAAC Accredited
Approved by AICTE, New Delhi, Govt. of Maharashtra &
Affiliated to RTM Nagpur University, Nagpur

BEELE302T: Non-Conventional Energy Sources

Crossword Puzzle: Unit – II (Solar Energy Concentrators) [CO2]



Directions to solve the puzzle:

Across:

6: Principle for the conversion of solar radiation into heat
10: An artificial water body
13: Type of selective absorber coating
15: An important technical parameter for solar concentrators

Down:

2: Property to withstand in the extreme atmospheric condition
5: A type of lens used in solar highway
11: One of the variable on which the transmitivity of surface depends
15: A type of solar energy storage

Course Co-ordinator
BEELE302T

Department of Electrical Engineering

Course: BEELE304T – Network Analysis

LEARNING OUCOMES PUZZLE

Activity 1: To assess the individual efforts and team work with an step puzzle as learning outcome of Unit – I and Unit- II

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The Step puzzle will be floated in the whatsapp group at 10.00 am in the morning.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the whatsapp group first with correct answer will be declared as winner.

Problem statement of the puzzle:

The numerical that were while learning the various topics during Unit – I & II will be given that answer of the first question is the value of element of next question using this phenomenon five questions are given. Students have to solve each numerical and write down the answer one by one in the sequence as it is asked and post the solutions on specified time in the specified location.

The step puzzle is as given below in the Annexure:

Course Coordinator
BEELE304T - NA

Department of Electrical Engineering

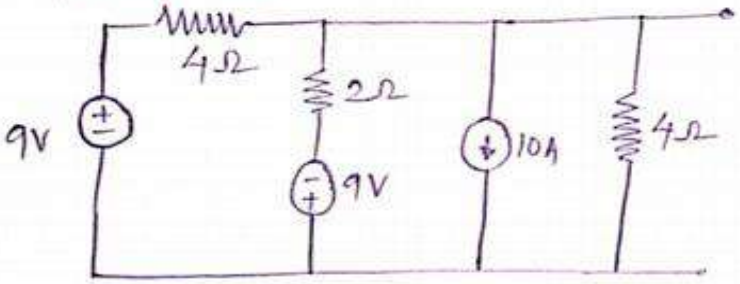
Course: BEELE304T – Network Analysis

Step Puzzle

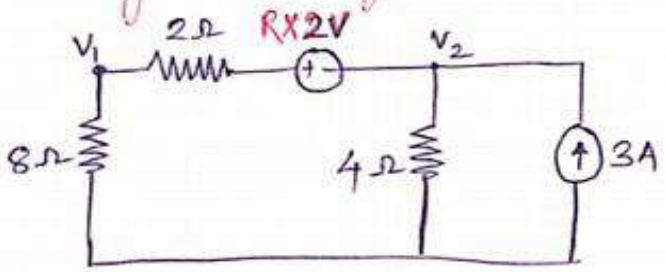
Instructions

1) Make a group of five students.
2) Every group have to solve this puzzle in time limit.
3) In this step puzzle the answer of previous question is the any element value of the next question.
4) The time Limit of the puzzle is 30 min. If your answer get before 30 min then you will display your answer in the whatsapp group with proof.
5) After 30 minutes, your answer will not consider at that time your group will be disqualified.
6) Winner group will get the 1 rank certificates.

Q1. Convert the following circuit into current source in parallel with resistance.



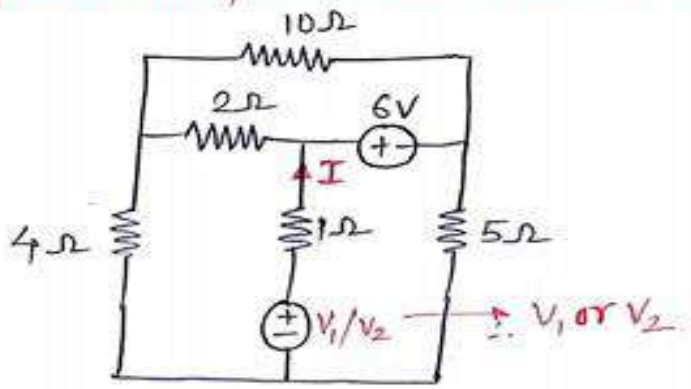
Q2. Calculate V_1 & V_2 in the circuit given below using Nodal Analysis.



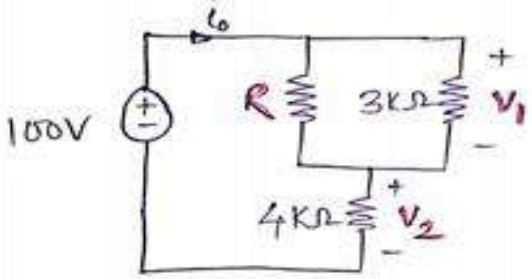
Department of Electrical Engineering

Course: BEELE304T – Network Analysis

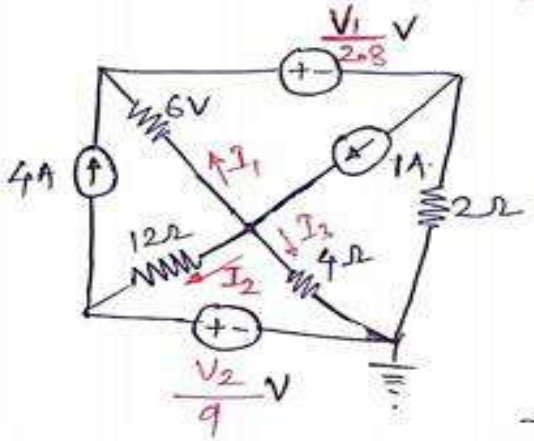
Q3. Apply mesh analysis to find current I in the following fig



Q4. In the circuit, find the values of R, V_1 & V_2 given that $i_o = (I-1)\times 10^{-1}$ A

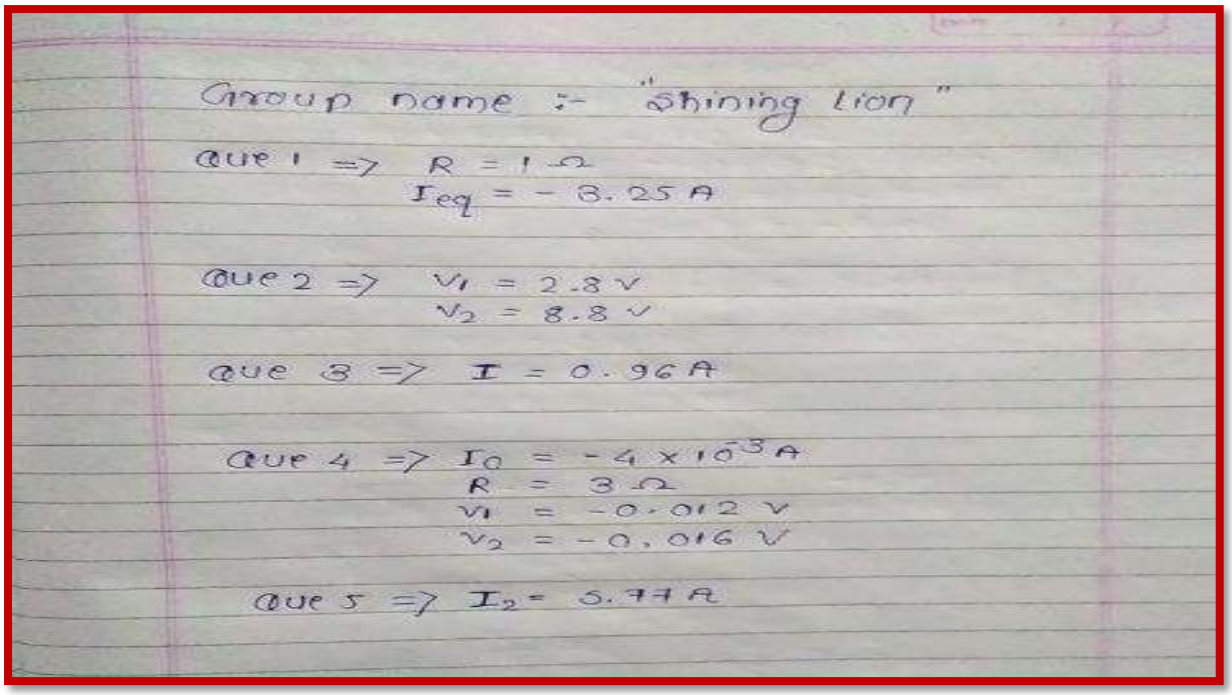


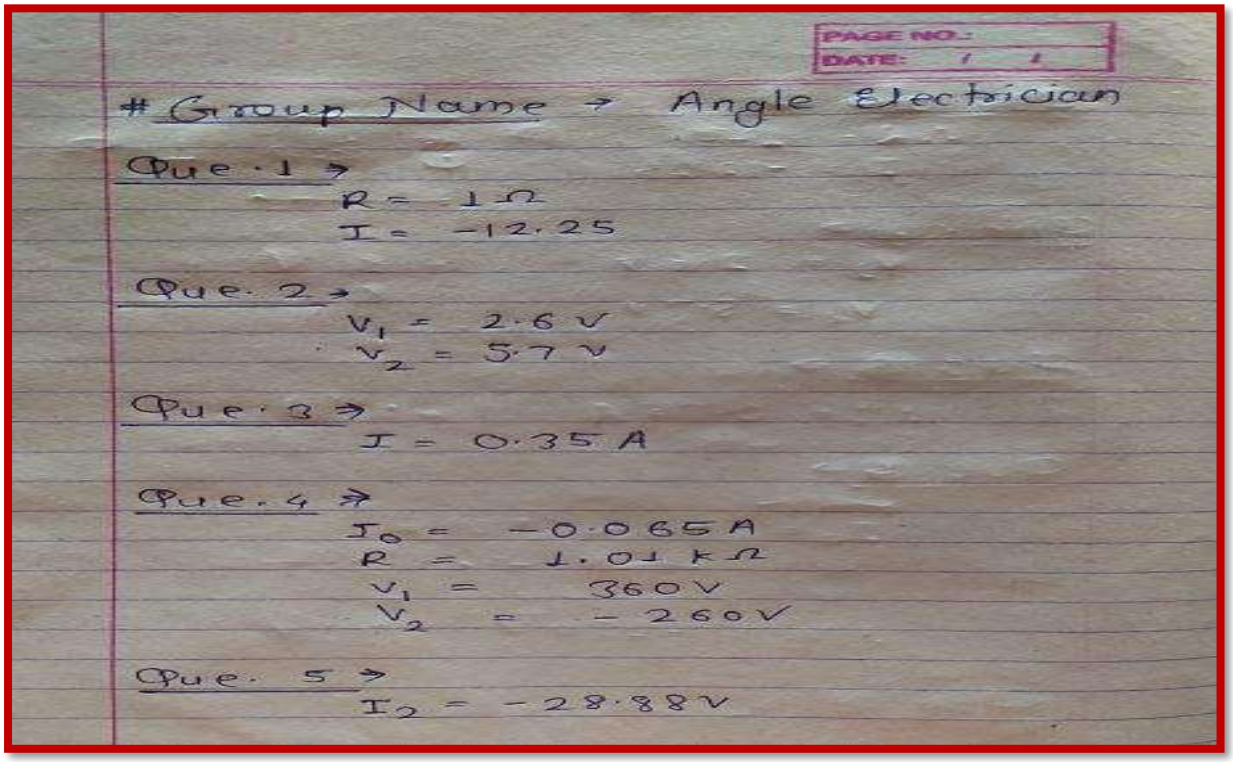
Q5. In the circuit, solve for I_2



If and only if the value of I_2 is correct & accurate. then only you are Winner..

The Responses by the Students Groups

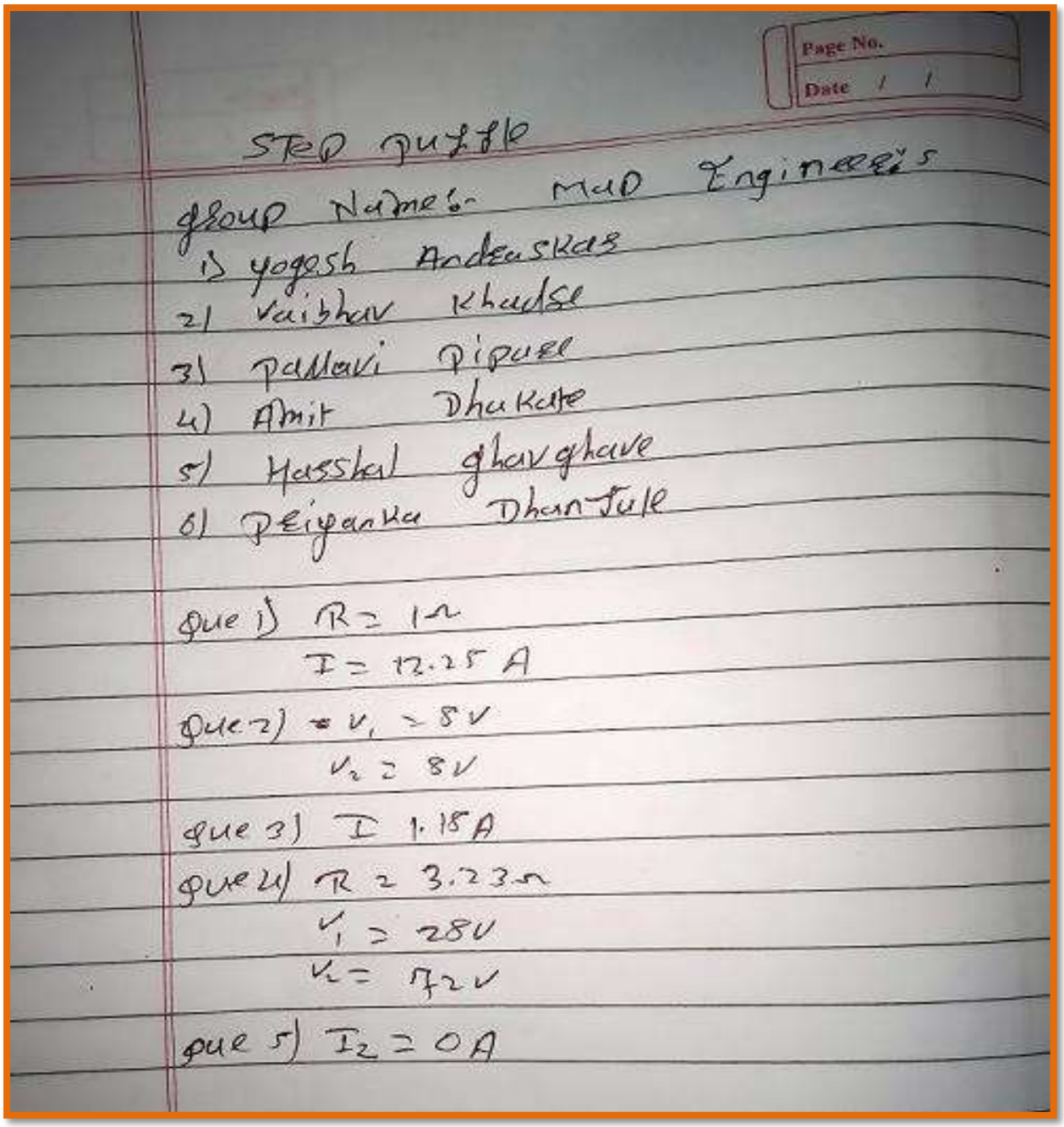




Answer of Winner Group:-

Department of Electrical Engineering

Course: BEELE304T – Network Analysis



Department of Electrical Engineering

Electronic Device & Circuits

LEARNING OUCOMES PUZZLE

Activity 1: To assess the individual efforts and team work with an word jumbling puzzle as learning outcome of Unit – I.

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The word jumbling based puzzle will be floated in the whatsapp group at 4.00 pm in the evening.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the whatsapp group/Personally.

Problem statement of the puzzle:

The terminologies that were while learning the various topics during Unit – I will be resembled using the word jumbling. Students have to answer the given questions in one word and find that answer in word jumbling and post the solutions on specified time in the specified location.

The terminologies are as given below in the Annexure:

Course Coordinator
BEELE305T - EDC

Department of Electrical Engineering
Electronic Device & Circuits

TGPCET/EE

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited

Department of Electrical Engineering

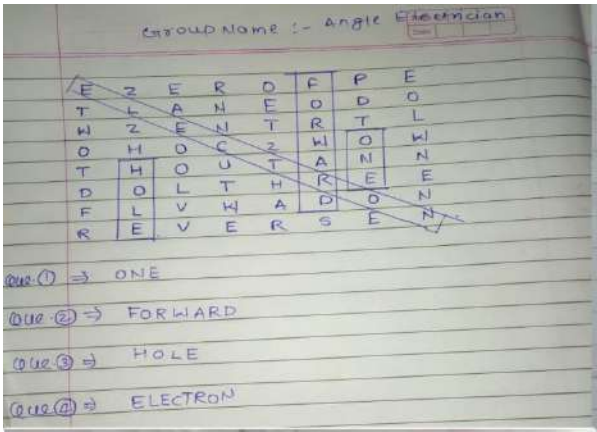
Solve the following Word Jumbling Puzzle.

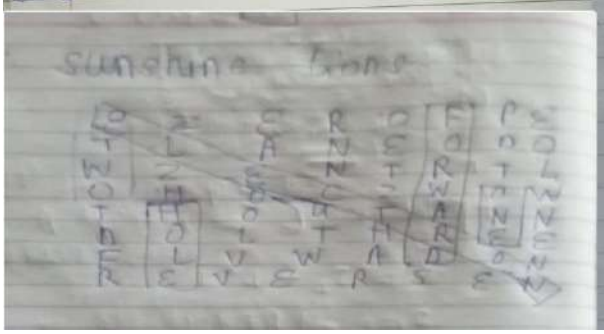
Instructions to solve the Puzzle

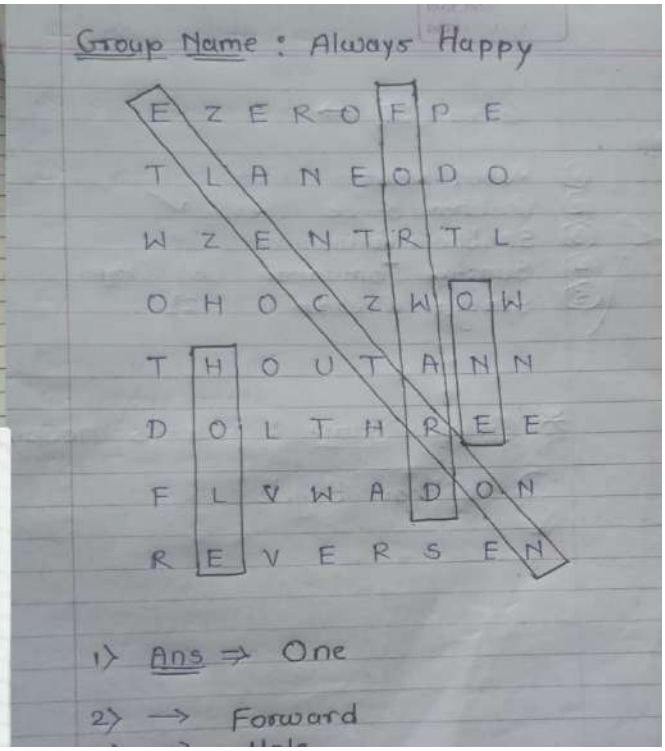
1. Answers of the given questions are hidden in the table given below.
2. Find the answers of the given questions in single word.
3. You have to write the word table as it is on paper and encircle the correct answers.
4. Find the single word in the table below

E	Z	E	R	O	F	P	E
T	L	A	N	E	O	D	O
W	Z	E	N	T	R	T	L
O	H	O	C	Z	W	O	W
T	H	O	U	T	A	N	N
D	O	L	T	H	R	E	E
F	L	V	W	A	D	O	N
R	E	V	E	R	S	E	N

1. How many junction/s do a diode consist?
2. If the positive terminal of the battery is connected to the anode of the diode, then it is known as
3. The p-region has a greater concentration of_____as compared to the n-region in a P-N junction.
4. The n-region has a greater concentration of_____ as compared to the p-region in a P-N junction diode.







Department of Electrical Engineering

Course: BEELE501T – Electrical Power System- I

LEARNING OUCOMES PUZZLE

Activity 1: To assess the individual efforts and team work with an emoji puzzle as learning outcome of Unit – I.

Date of conduction :- 17.8.2020

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The emoji based puzzle will be floated in the whats app group at 9.00 am in the morning.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the whatsapp group first will be declared as winner.

Problem statement of the puzzle:

The terminologies that were while learning the various topics during Unit – I will be resembled using the emoji's. There are 25 such words. Students have to identify each word, write it down one by one in the sequence as it is asked and post the solutions on specified time in the specified location.

The terminologies are as given below in the Annexure:

Sd/-
Prof. Praful Ghadge
Course Coordinator

Directions to Given to students to solve the emoji puzzle -

1. Write the name of the words by identifying the emoji used to express the alphabet.

2. Write down word in sequence as it is mentioned in emoji puzzle.

3. Write the name of group along with the group members on top of the paper followed by answers in sequence and post it on was up group.

4. Deadilne to post your answers is before 10.00 am failing to which group will b disqualified...

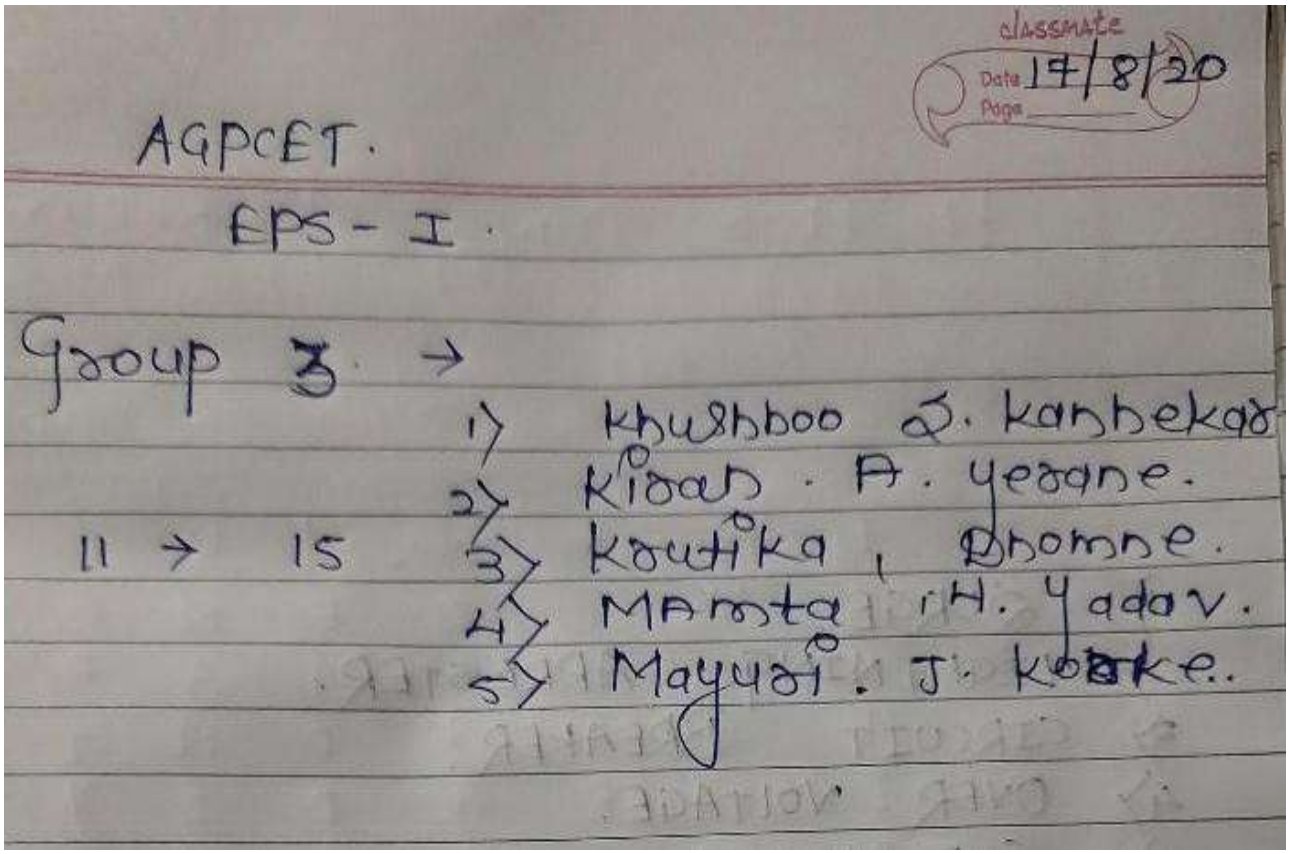
5. Group which will post correct ans in min time will b a winner....

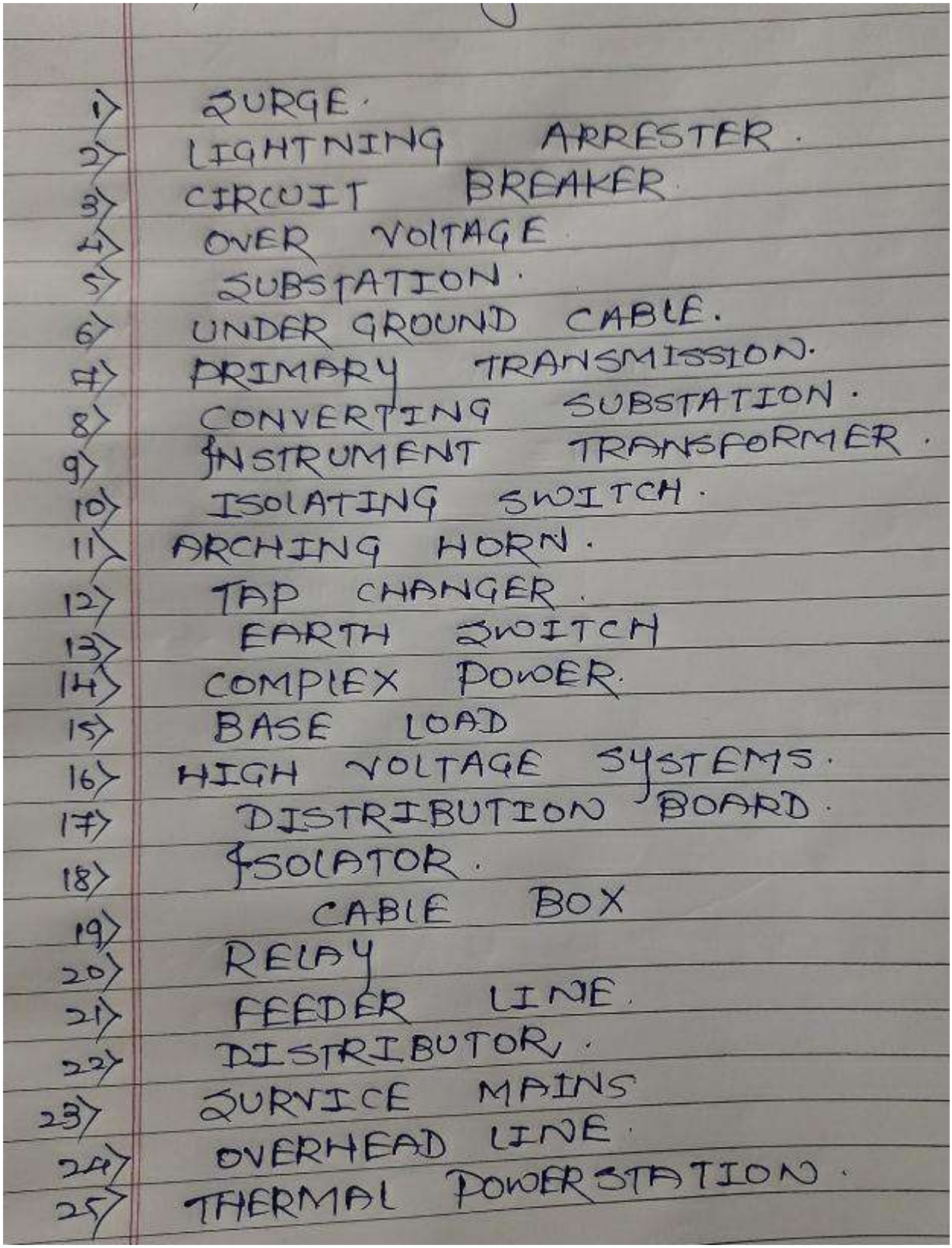
Emoji based Puzzle Questions :-

Answers :-

Sr. No	Puzzle Answer
1	Surge
2	Lightening Arrestor
3	Circuit Breaker
4	Overvoltage
5	Substation
6	Underground Cable
7	Primary Transmission
8	Converting Substation
9	Instrument transformer
10	Isolating Switch
11	Arching Horn
12	Tap changer
13	Earth Switch
14	Complex Power
15	Base Load
16	High Voltage system
17	Distribution Board
18	Isolator
19	Cable Box
20	Relay
21	Feeder Line
22	Distributor
23	Service Mains
24	Overhead Line
25	Thermal Power Station

Correct answer given by Group No. 13 :-




1) SURGE.
2) LIGHTNING ARRESTER.
3) CIRCUIT BREAKER.
4) OVER VOLTAGE.
5) SUBSTATION.
6) UNDER GROUND CABLE.
7) PRIMARY TRANSMISSION.
8) CONVERTING SUBSTATION.
9) INSTRUMENT TRANSFORMER.
10) ISOLATING SWITCH.
11) ARCHING HORN.
12) TAP CHANGER.
13) EARTH SWITCH
14) COMPLEX POWER.
15) BASE LOAD
16) HIGH VOLTAGE SYSTEMS.
17) DISTRIBUTION BOARD.
18) ISOLATOR.
19) CABLE BOX
20) RELAY
21) FEEDER LINE.
22) DISTRIBUTOR.
23) SURVICE MAINS
24) OVERHEAD LINE.
25) THERMAL POWER STATION.

LEARNING OUCOMES PUZZLE

Activity 1: To assess the individual efforts and team work with an emoji puzzle as learning outcome of Unit – I.

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The emoji based puzzle will be floated in the whatsapp group at 9.00 am in the morning.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the whatsapp group first will be declared as winner.

Problem statement of the puzzle:

The terminologies that were while learning the various topics during Unit – I will be resembled using the emoji's. There are 25 such words. Students have to identify each word, write it down one by one in the sequence as it is asked and post the solutions on specified time in the specified location.

The terminologies are as given below in the Annexure:

Course Coordinator

BEELE302T - NCES

LEARNING OUCOMES PUZZLE

Activity 1: To assess the individual efforts and team work with an emoji puzzle as learning outcome of Unit – I.

Methodology:

1. The class is divided in several groups of 4-5 students each.
2. The group has to nominate one member as leader of the group.
3. The emoji based puzzle will be floated in the whats app group at 9.00 am in the morning.
4. The team has to complete the task in 1 hour.
5. The team that will submit the solution in the group first will be declared as winner.

Problem statement of the puzzle:

The terminologies that were while learning the various topics during Unit – I will be resembled using the emoji's. There are 10 such words. Students have to identify each word, write it down one by one in the sequence as it is asked and post the solutions on specified time in the specified location.

The terminologies are as given below in the Annexure:

Course Coordinator
BEELE502T - UEE


1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
4:23 pm

Day 4 Puzzle

Make the Meaningful words related to

General Requirements & Inspection of Electrical Installation of Domestic and Commercial Building according to IS: 732-1982

1. ERISAUDL NTCUERR
2. GNIDNOB TORDUCCON
3. ECAPS TORCAF
4. HOVEERAD EILNS
5. GHLITGIN CUITCIRS
6. ITCHSWSDRAOB
7. SREMROFSNART
8. INGHTRAE
9. SELABC
10. UCHTO AGETLOV
11. XIMAUMM V ADEMDN
12. GNIESTT VFO VONITLALATSNI
13. LEBAC RELPOUC
14. VEITCEPORT ORTDUCONC
15. ALNOMIN AGETLVO
16. ARLOS IONDIATAR
17. CIMSIES FEFTCSE
18. ZIRALOPNOITA EXDIN
19. TERMMEHOMEG
20. ROTERANEG TES
21. ORATSEG TETBASEIR
22. ENTISNART
23. ALUTUM DUCNIECNAT
24. LEBUOD IONSULATNI
25. THERA SEDORTCLEE

Name: Reg Id:-

GM All
Day-5

New Thoughts & Curiosity to get New Things to Learn

Puzzle

Here comes puzzle
Fill the blanks to form meaningful word

Individual Task

1) _ _ A_ E _
2)_ I _ _ T _ C E _ E _ _ _
3)L _ _ _ S
4)R _ _ O _ C_ _ P_R _O _ _
5) D _ T _ C_ _ L _
6) _ S _ _ L _ _ _ R _
7) E _ _ _ G _ E_ _ I _ _ E_ _ M_ _ _ R _
8) _ _ A_ O _ C_P_ _R _ _ S _
9) B_ _ A _ _ _ W _ T _ _ Q _ _
10) _ _ A _ _ O _
11) F _ _ M _ S_ _ _
12) A_ _ O _ _ A_ S_ _ _ M_ _
13) A_ _ I _ _ _ T _ _ _ E _ A_ _ R _
14) R_ _ _ R S _ _ _ T
15) _ ON _ T _ _ T S _ _ E _

Team ISEITM

Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology, Nagpur