ST. ANNE'S

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

GE 3271 ENGINEERING PRACTICES LAB MANUAL (ELECTRICAL & ELECTRONICS)

I YEAR – II SEMESTER **COMMON TO ALL BRANCHES**

NAME:----------

REG NO:----------

DEPT :----------

SYLLABUS – ANNA UNIVERSITY – CHENNAI

GE 3271 - ENGINEERING PRACTICES LABORATORY

(ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICE 15 HOURS

1. Introduction to switches, fuses, indicators and lamps-Basic switch board wiring with lamp, fan and three pin socket
2. Staircase wiring
3. Fluorescent Lamp wiring with introduction to CFL and LED types.
4. Energy meter wiring and related calculations/ calibration
5. Study of Iron Box wiring and assembly
6. Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
7. Study of emergency lamp wiring/Water heater

ELECTRONICS ENGINEERING PRACTICE 15 HOURS

Soldering Work:

1. Soldering simple electronic circuits and checking continuity.

Electronic Assembly and Testing Work:

1. Assembling and testing electronic components on a small PCB.

Electronic Equipment Study:

1. Study an elements of smart phone..
2. Assembly and dismantle of LED TV.
3. Assembly and dismantle of computer/ laptop

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EX.NO: 1 **DATE:**

RESIDENTIAL HOUSE WIRING USING SWITCHES, FUSE, INDICATOR, LAMP AND ENERGY METER.

AIM:

To construct residential house wiring using switches, fuse, indicator, lamp and energy meter.

MATERIALS REQUIRED:

Sl.No	Name of the apparatus	Range / Type	Quantity
1	Switch	SPST, 5A	3 Nos.
2	Incandescent Lamp	100	1 No.
3	Lamp Holder	Batten	1No.
4	Ceiling rose	-	1No.
5	Socket	10	1No.
6	Screws	1inc	As per required
7	Wires	1/18SWG	As per required
8	Switch Board	12""x 8""	1No.
9	Energy Meter	100V , 16A	1No.
10	Main switch Box	300V , 16A	1No.

THEORY:

Conductors, switches and other accessories should be of proper capable of carrying the maximum current which will flow through them. The following table shows the rating for different accessories. Conductors should be of copper or aluminum. In power circuit, wiring should be designed for the load which it is supposed to carry. Power sub circuits should be kept separate from lighting and fan sub – circuits. Wiring should be done on the distribution system with main and branch distribution boards at convenient centers. Wiring should neat, with good appearance.

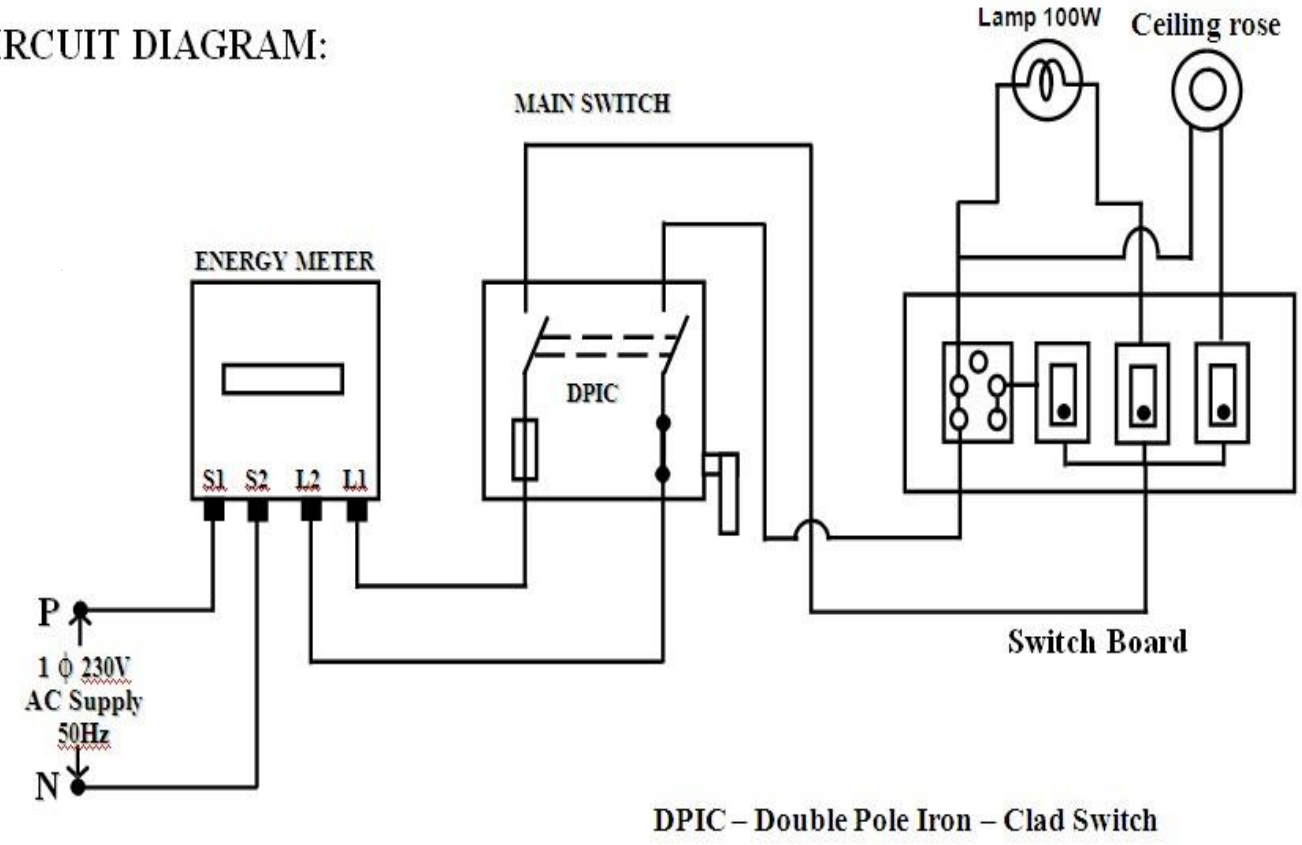
Wires should pass through a pipe or box, and should not twist or cross.

The conductor is carried in a rigid steel conduit conforming to standards or in a porcelain tube.

PROCEDURE:

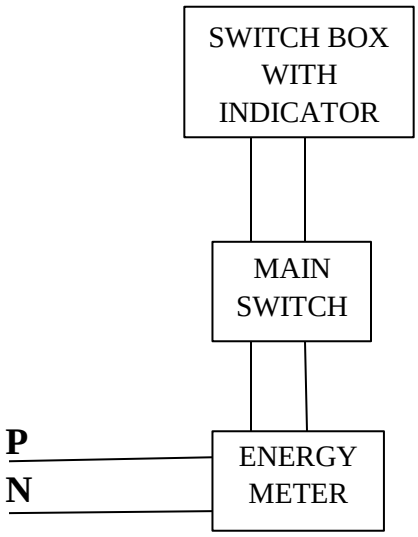
1. Study the given wiring diagram
2. Make the location points for energy meter, main witch box, switchboard, lamp and ceiling rose.
3. Draw the lines for wiring on the wooden board.
4. Place the wires along with the line and fix.
5. Fix the bulb holder, Switches, Ceiling rose, Socket in marked positions on the wooden board.
6. Connect the energy meter and main switch box in marked positions on the wooden board.
7. Give a supply to the wires circuit.
8. Test the working of light and socket.

CIRCUIT DIAGRAM:



DPIC – Double Pole Iron – Clad Switch

LAYOUT DIAGRAM:



RESULT:

EX.NO: 2 **DATE:**

STAIRCASE WIRING

AIM:

To setup a staircase wiring using the given lamps, controlled by switches.

MATERIALS REQUIRED:

Sl.No	Name of the apparatus	Range / Type	Quantity
1	Incandescent Lamp	100 W	1 No
2	Lamp Holder	Pendent Type	1 No
3	SPDT Switch	230V,5A	1 No
4	Wires	1/18”	As per requirement
5	P.V.C Pipe	1/4"	As per requirement
6	Wooden Board	-	1 No
7	Round block	-	1 No

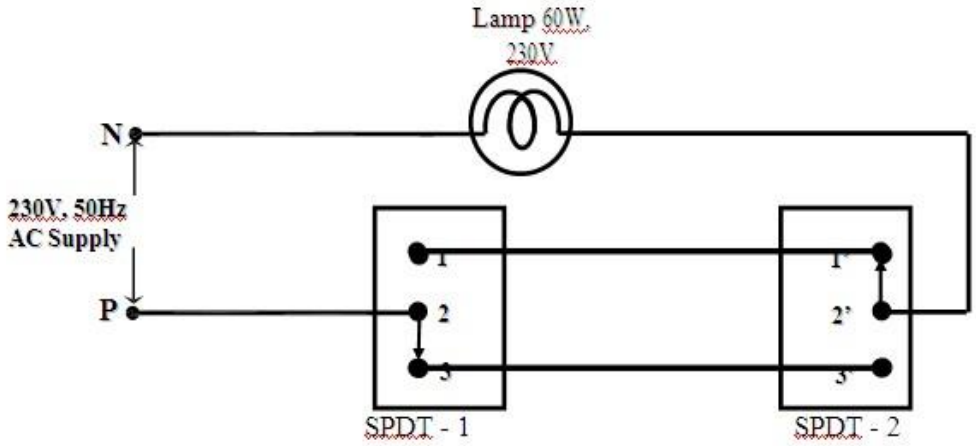
THEORY:

In this wiring a single lamp is controlled from two places. For this purpose two numbers of two-way switches are used.

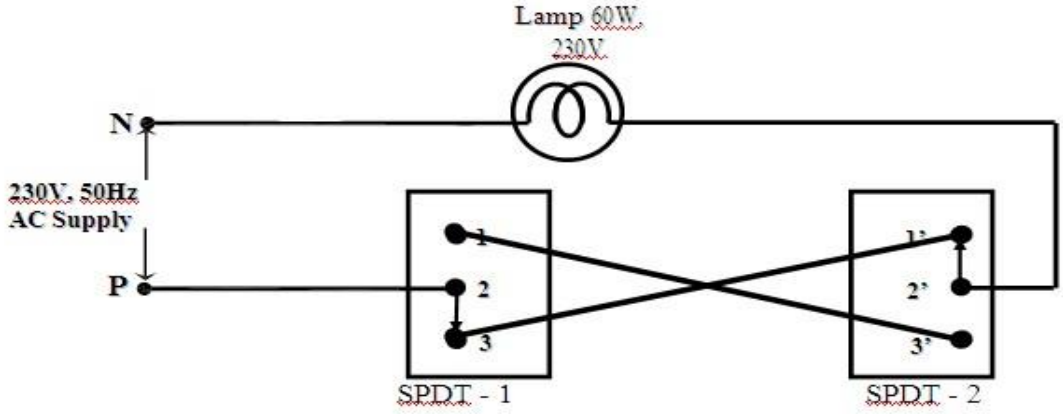
PROCEDURE:

1. Place the accessories on the wiring board as per the circuit diagram.
2. Place the P.V.C pipe and insert two wires into the P.V.C pipe.
3. Take one wire connect one end to the phase side and other end to the middle point of SPDT switch 1
4. Upper point of SPDT switch 1 is connected to the lower point of SPDT
5. switch2.
6. Lower point of SPDT 1 is connected to the upper point SPDT switch2.
7. Another wire taken through a P.V.C pipe and middle point of SPDT
8. switch 2 is connected to one end of the lamp holder.
9. Another end of lamp holder is connected to neutral line.
10. Screw the accessories on the board and switch on the supply.
11. Circuit is tested for all possible combination of switch position.

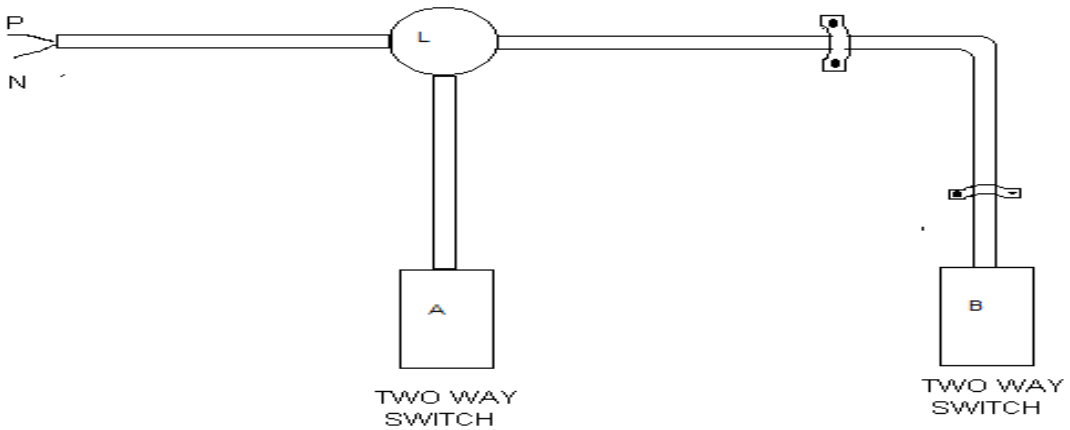
CIRCUIT DIAGRAM (STRAIGHT CONNECTION):



CIRCUIT DIAGRAM (CROSS CONNECTION):



LAYOUT DIAGRAM:



POSITION DIAGRAM:

Sl.no	SPDT 1	SPDT 2	Output-Lamp
STRAIGHT CONNECTION			
1			
2			
3			
4			
CROSS CONNECTION			
1			
2			
3			
4			

RESULT:

EX.NO: 3 **DATE:**

FLUORESCENT LAMP WIRING

AIM:

To make and check the fluorescent lamp wiring and also check its accessories.

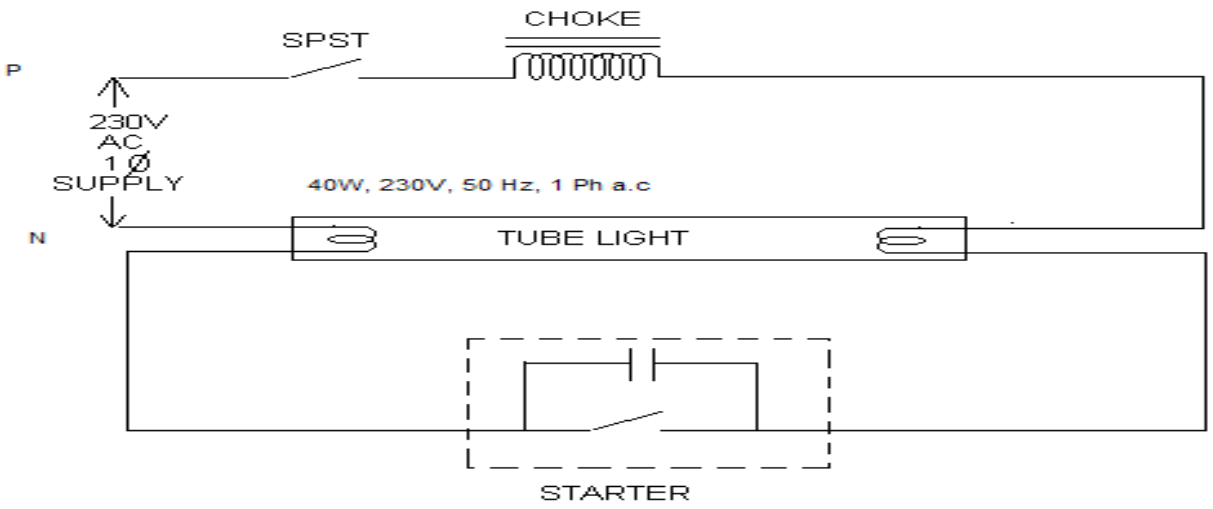
MATERIALS REQUIRED:

S.No	Name of the apparatus	Range / Type	Quantity
1	Fluorescent lamp fixture	4 ft	1 No
2	Fluorescent lamp	40W	1 No
3	Choke	40W, 230V,	1 No
4	Starter		1 No
5	wires	1/18”	As per requirement

THEORY:

Tube light has filament on either side. They are coated with tungsten material. The inside of the tube has phosphorous coating which is used to convert ultraviolet into visible light and to give the required color sensation. A choke is used to give transient high voltage so as to initiate the electron movement which is an iron starter capacitor is used to suppress radio- interference with the switch closed. The current flows through the choke and the starter. The glow switch suddenly breaks thereby creating the circuit. Due to high conductivity, inductive property of the choke, a transient high voltage is available across the filament. Hence the electrons are emitted and travel through the tube. Then tube light is produced.

CIRCUIT DIAGRAM:



PROCEDURE:

1. Give the connections as per the circuit diagram as shown in figure.
2. Fix the tube holder and the choke in the tube.
3. The phase wire is connected to the choke and neutral directly to the tube
4. Connect the starter in series with the tube.

RESULT:

EX.NO: 4 **DATE:**

MEASUREMENT OF ENERGY USING SINGLE PHASE ENERGY METER

AIM:

To measure the energy in a single in a phase phase circuit using direct loading.

APPARATUS REQUIRED:

SL.No	Name of the Apparatus	Range / Type	Quantity
1	Single phase Energy meter	1500 rev / kWh, 240V, 50Hz	1No.
2	Wattmeter	300V, 10A, UPF	1No.
3	Voltmeter	(0-300)V, MI	1No.
4	Ammeter	(0-10)A, MI	1No.
5	Load	Resistive, 5kW	1No.
6	Wires	1 / 18 SWG	As per requirement

THEORY:

The energy meter is an integrated type of instrument, where speed of rotation of the aluminum to the power consumed and number of revolutions per minute is proportional to the energy consumed by the load.

The ratings associated with the energy meter are.

Voltage rating

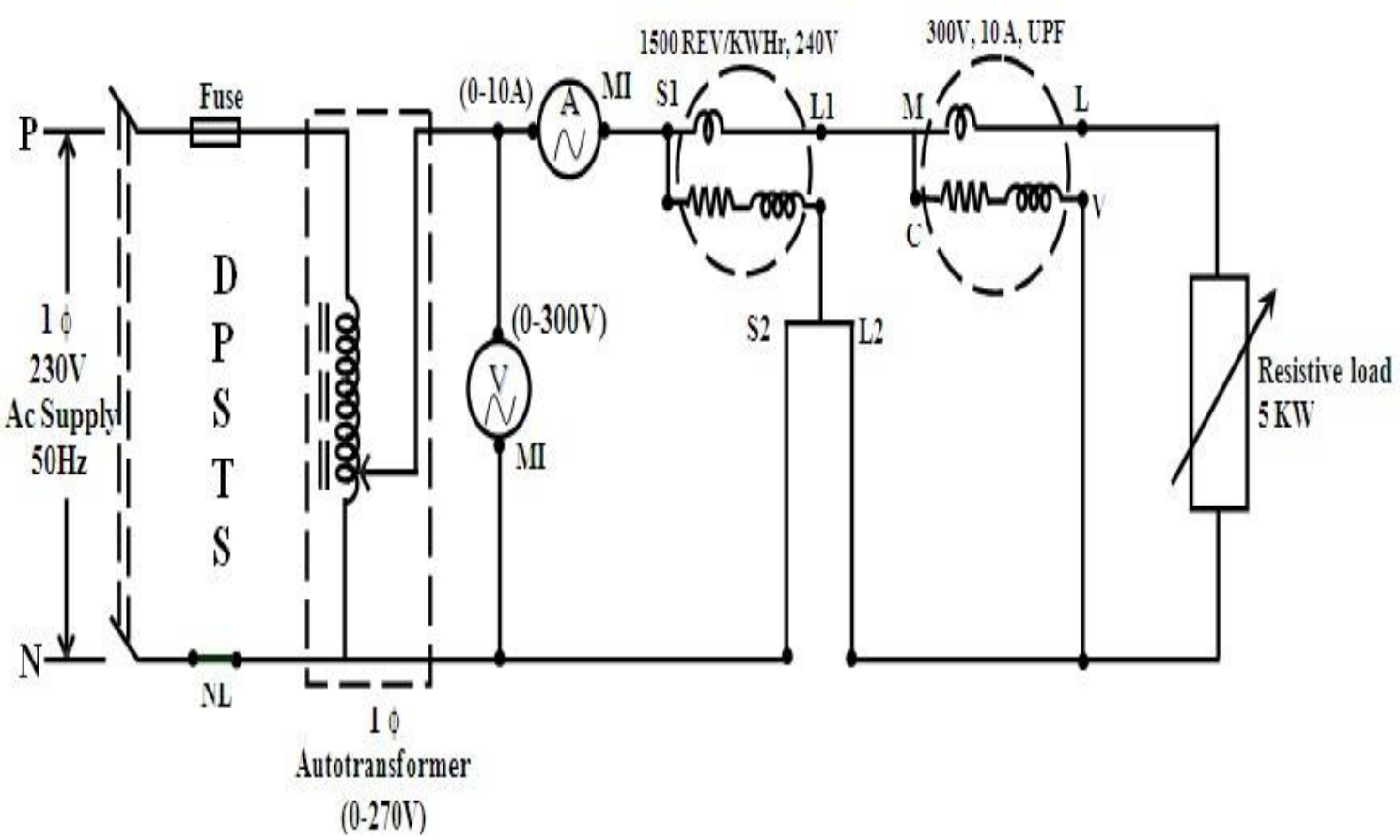
Current rating

Frequency rating

Meter Constant

The driving system of the meter provides the rotational surface of the torque for the moving system, which in turn activates the energy meter. The energy meter is operated at induction principle in which eddy current.

CIRCUIT DIAGRAM:



PROCEDURE:

1. Connections are made as per the circuit diagram.
2. Supply is given to the switch by closing the DPST switch.
3. By adjusting the voltage is brought to the rated voltage.
4. Load is switched On
5. Time taken for five revolutions in the energy meter is noted and the corresponding ammeter and voltmeter reading are noted.
6. The above procedure is repeated for different load current and for fixed number of revolutions.
7. Then the load is gradually released and supply is switched OFF.

OBSERVATION TABLE:

ENERGY METER CONSTANT _____ **MULTIPLICATION FACTOR**_____

Sl. No	Supply Voltage V	Load Current I (A)	Wattmeter Reading P (W)		Time t (sec)	True Energy (kWh)	Measured energy (kWh)
			OBS	ACT			

FORMULA:

True energy = ———— kWhr

Measured energy = ————————

Multiplication factor (MF) = ————————————————

P → power in wattmeter

T → time taken for five revolutions

N → number of revolutions

EX.NO: 5 **DATE:**

STUDY OF IRON BOX WIRING AND ASSEMBLY

AIM:

To study of Iron Box wiring and assembly with its working principle.

REQUIREMENTS:

1. Iron box
2. Tools

THEORY:

- The colours of three wires in a cable connected to the plug of an electric iron are:
  - Live wire - red
  - Neutral wire - black
  - Earth wire - green
- The electric wiring in houses, shops, or factories has three wires: live, neutral and earth. The first two carry electric current from the power station and the third is earthed by connecting it to the earth through a metal wire called 'Earth Wire'.
- To avoid confusion between these three wires, we follow different colour code to insulate these wires. This colour coding of wires helps us to connect the switches, plugs and other electrical components through the appropriate wire in the home wiring circuit.
- The red wire is the live wire, the black wire is neutral and the earth wire is given green insulation.

CIRCUIT DIAGRAM:

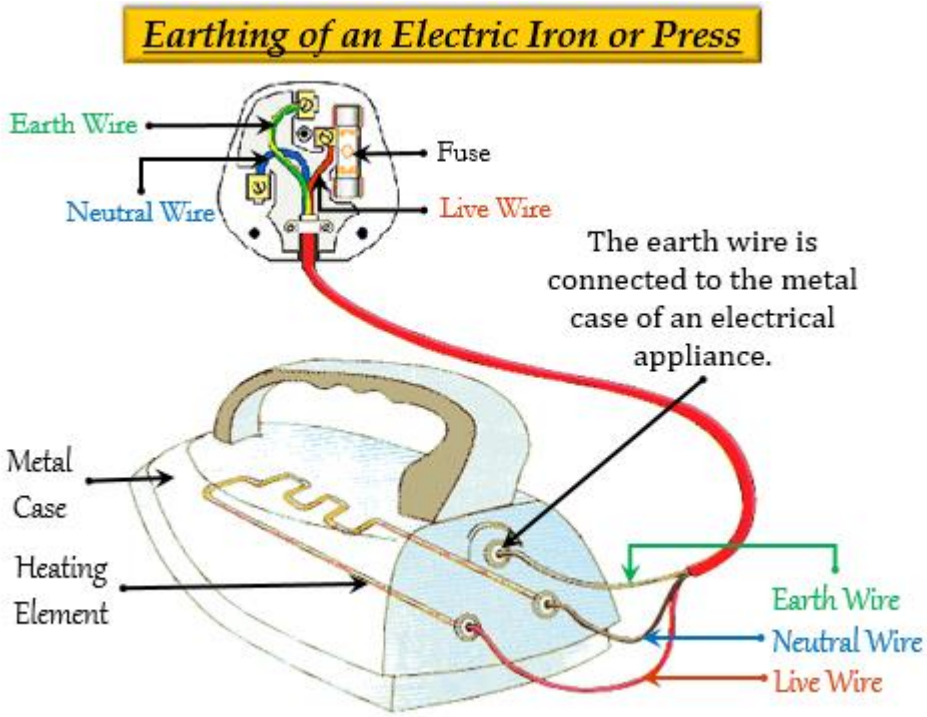


Fig: Wiring diagram of iron box

RESULT:

The iron box wiring and assembly has been studied.

EX.NO: 6(i) **DATE:**

STUDY OF FAN REGULATOR (RESISTOR TYPE)

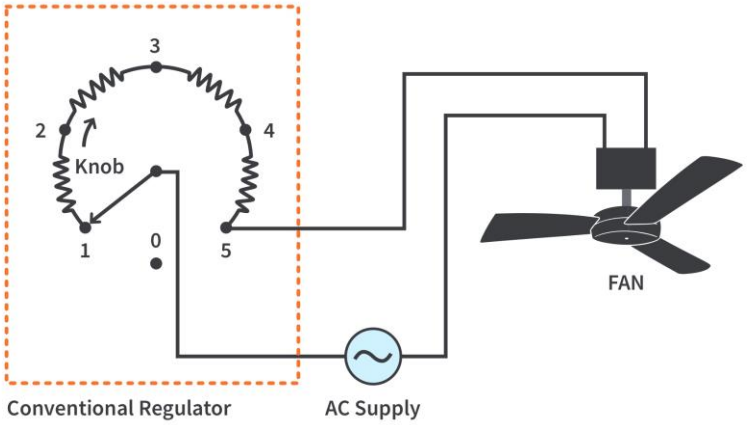
AIM:

To study the electronic type using Diac/Triac type fan regulator.

REQUIREMENTS:

1. AC Power supply
2. Fan
3. Resistor by regulator
4. Electronic type regulator

CIRCUIT DIAGRAM



THEORY:

- A fan is probably one of the most used household electrical appliances in the world but they are also used extensively for thermal management.
- Before we dive into what regulates and controls fans, we shall first look at the fan itself and understand how its speed is controlled.
- Regulators are devices that are used to control the speed of the fan. Today, electronic regulators are used everywhere and it's hard to find conventional regulators being used. Let's see why.
- The conventional type, also called the resistor type regulator is a basic potential divider circuit as shown below.
- As we go on changing the position of the knob from 1 to 5, the series resistance keeps on decreasing and hence the voltage applied to the fan increases and so does the speed.

- But in this type of regulator, the energy we save in running the fan at slower speeds is lost in heating up the resistors.
- This damages the regulator over a period of time and hence they aren't reliable.
- Also, they are bulky.

RESULT:

Thus the resistor type regulator of fan has been studied.

EX.NO: 6(ii) **DATE:**

STUDY OF FAN REGULATOR (ELECTRONIC TYPE) USING DIAC/TRIAC/QUADRAC

AIM:

To study the electronic type using Diac/Triac type fan regulator.

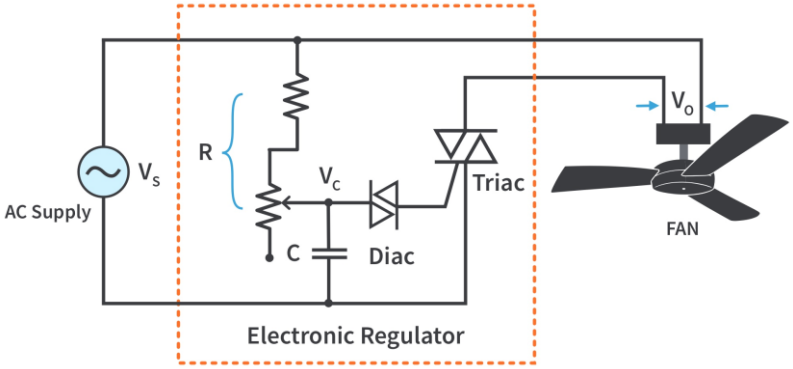
REQUIREMENTS:

1. AC Power supply
2. Fan
3. Resistor by regulator
4. Electronic type regulator

THEORY:

- Today, we use smaller electronic regulators which consist of power semiconductor devices - mainly the TRIAC and the DIAC.

CIRCUIT DIAGRAM (of voltage regulator using triac, diac)



COMPONENTS:

TRIAC:

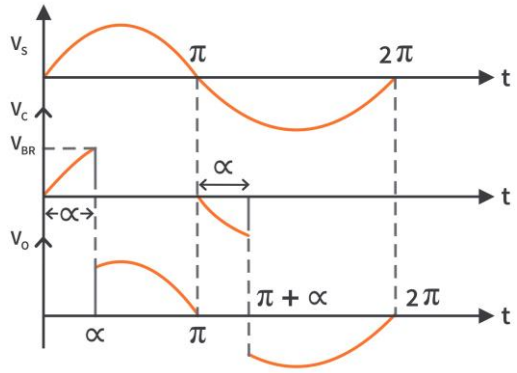
- A TRIAC is a three terminal semi-controlled power semiconductor device which conducts current in both the directions when triggered. The trigger pulse is given to the gate terminal (G) of the device.

DIAC

- A DIAC is a two terminal uncontrolled power semiconductor device which conducts current in both the directions when the voltage across the device crosses a certain threshold level called the breakdown voltage (V_{BR}).

Operation of the Electronic Voltage Regulator Circuit

- Consider the positive half cycle of the supply.
- As the TRIAC is not yet triggered, it remains off condition and the voltage across the fan is zero.
- And hence the current flows through the resistor capacitor branch and charges the capacitor.
- Once the capacitor is sufficiently charged enough such that the voltage across the DIAC crosses its breakdown voltage level (V_{BR}), it conducts triggering the TRIAC and turning it on and now, the supply voltage appears across the fan.
- The same thing happens even in the negative half cycle.
- As the voltage doesn't appear across the fan for the complete cycle, the RMS value of the voltage across the fan decreases and hence its speed reduces.



- The RMS voltage across the fan depends on ∝, which is the time taken by the capacitor to charge up to the voltage V_{BR}.
- This depends on the time constant (R*C) of the resistor capacitor branch.
- As we decrease the value of the resistance R, the time constant decreases which results in the decrease in ∝ which in turn increases the RMS value of the voltage across the fan and hence increasing the speed and vice versa.
- Therefore, by varying the resistance R, we can control the speed of the fan using the electronic regulator.
- In the case of electronic regulators, the loss of energy as heat through resistors is much less as only a very small current flows through them.
- Also, they are small and compact and have a quicker response time, making them more widely used.

Result:

Thus the electronic type using Diac/Triac type fan regulator has been studied.

EX.NO: 7(i) **DATE:**

STUDY OF WATER HEATER WIRING

AIM:

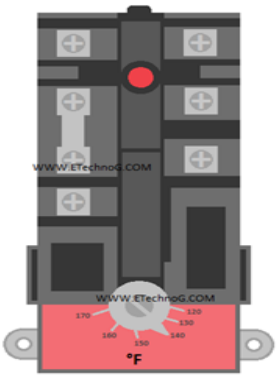
To Study of Water heater

REQUIREMENTS:

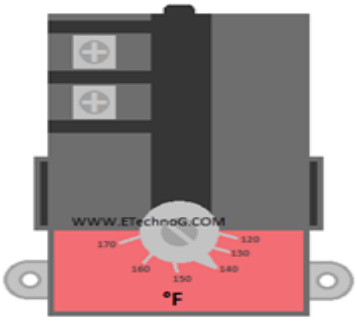
1. AC Power supply
2. Water heater

THEORY:

- An electric heater is an instrument that converts electrical energy into heat energy.
- The connection diagrams show the connections used in geysers.
- Electric heaters come with very useful during the winter seasons for water heating, room heating, and many other applications.
- Heaters are wired with the objective of proper heating, safety, automatically, on, off, etc.
- It will helps to find out the internal fault in a water heater system and is easy to repair.
- There are two types of water heater systems mostly used –
    1. Single Element Water Heater and
    2. Double Element Water Heater.
- Single Element water heaters are those which use a single heating element for heating.
- The double-element water heaters are those which use two heating elements for heating.
- Most of the water heaters come with a thermostat connection.
- A thermostat is a device that allows to turn on or turn off the heating element automatically.
- Also, we can set the temperature according to our requirements.
- So, here we will see the thermostat connection also.



Upper Thermostat



Lower Thermostat

There are two types of thermostats used in a double-element water heater system - Upper Thermostat and Lower Thermostat.

- The upper thermostat has a total of five terminals for its connection and the lower thermostat has a total of two terminals for its connection.
- The terminal diagram of the upper and lower thermostat are shown in the diagram.

RESULT:

Thus the water heater has been studied.

EX.NO: 7(ii) **DATE:**

STUDY OF EMERGENCY LAMP WIRING

AIM:

To study of emergency lamp wiring with its working principle.

REQUIREMENTS:

1. Variable resistor
2. Resistors – 10kΩ, 33kΩ / 1W
3. White LED – 1 Watt
4. Battery 12 v
5. Transistors – BD140 and BD139
6. Switch
7. LDR (Light Dependent Resistor)

THEORY:

- Definition: An emergency light is used to automatically turn ON a lamp which is operated by a battery.
- It stops the user from being into a difficult situation because of unexpected darkness and helps the user to get access to make an instantaneous emergency light.
- Emergency lights are connected to the electrical supply of the building.
- Each light has its own circuit.
- These lights include a battery so that it works like a backup power supply once the building loses its power supply.
- Here, the lifespan of a battery is short when we compare it with other kinds of lighting systems.
- So all the emergency lights must be checked to make sure the battery can give emergency light for a minimum of 90 minutes.
- These tests are necessary to check the performance of the battery every six months with professionals.

CIRCUIT DIAGRAM

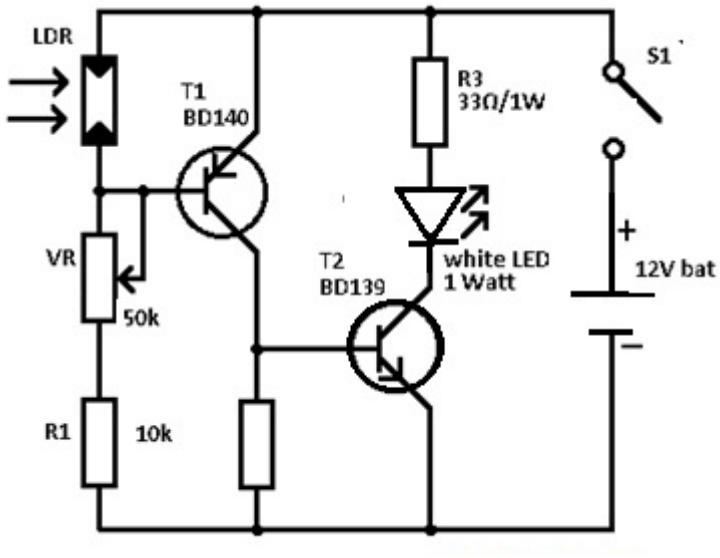


Fig. Emergency Light Circuit using 12v Battery

RESULT:

The emergency light circuit is studied and observed the operating principles along with its applications

EX.NO: 8 DATE:

SOLDERING WORK

(a) SOLDERING SIMPLE ELECTRONIC CIRCUITS AND CHECKING CONTINUITY

AIM

To practice soldering and de-soldering for the electronic circuit by assembling and disassembling in the Printed Circuit Board (PCB) and check for its Continuity.

APPARATUS REQUIRED

S.NO	NAME OF THE APPARATUS	RANGE	QUANTITY
1.	PCB Board	-	1
2.	Soldering iron	60/40 grade	1
3.	Solder	-	As Required
4.	Soldering Flux	-	As Required
5.	Capacitor	100µf	As Required
6.	Resistor	1kΩ	As Required
7.	Multimeter	-	1

THEORY:

- ✓ Soldering is the process of joining electrical parts together to form an electric connection, using a molten mixture of lead and tin (solder), with a soldering iron.

Soldering Iron:

- ✓ It supplies sufficient heat to melt solder by heat transfer, when the iron tip is applied to a connection to be soldered.
- ✓ The soldering iron temperature is selected according to the work to be performed.

Soldering Iron Stand:

- ✓ The stand is the safe place to put the iron when we are not holding it.
- ✓ The stand includes a sponge which can be dampened for cleaning the tip of the iron.

Solder:

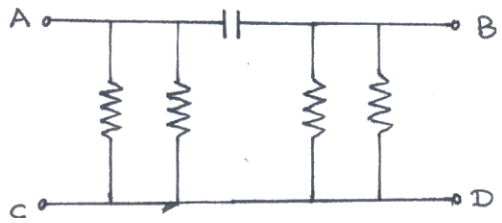
- ✓ It is alloy of low melting metals like tin, lead, cadmium, silver etc.
- ✓ The most commonly used alloy combination is 63% tin and 37% lead.

Soldering Flux:

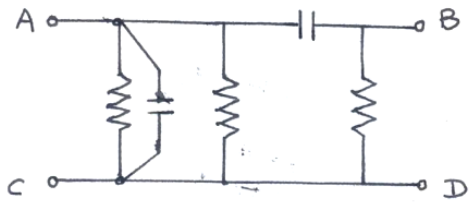
- ✓ It is a resin, applied on the work piece to be soldered, preventing contact with the atmosphere.
- ✓ It maintains a clean surface and dissolves oxides thereby enabling goodsoldering.
- ✓ Aluminium chloride or zinc chloride are commonly used as flux.
- ✓ The flux also assists in the transfer of heat from the soldering iron tip to the joint area.

SOLDERING:

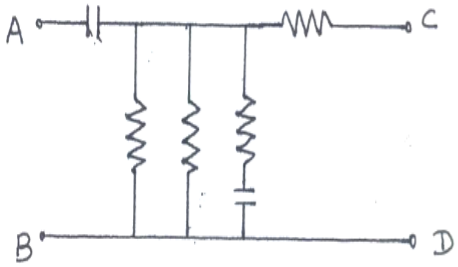
CIRCUIT DAIGRAM 1:



CIRCUIT DAIGRAM 2:

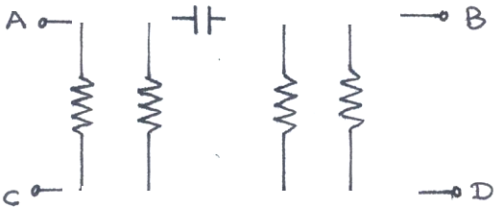


CIRCUIT DAIGRAM 3:

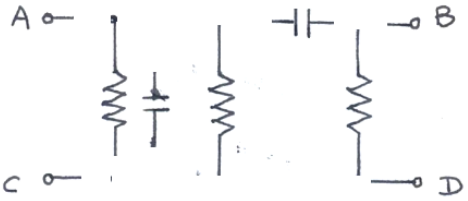


DESOLDERING:

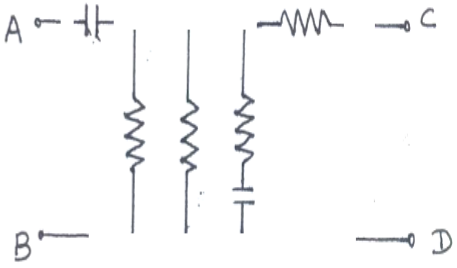
CIRCUIT DAIGRAM 1:



CIRCUIT DAIGRAM 2:



CIRCUIT DAIGRAM 3:



PROCEDURE:

SOLDERING:

1. Study the electronic circuit.
2. Clean the given PCB board.
3. Clean the tip of the soldering iron before heating and also the resistor, capacitor which are to be soldered.
4. Heat the soldering iron and apply solder to the tip as soon as it is hot to melt on it.
5. Bend the resistor leads to fit into the holes on the board.
6. Insert the resistor, as per the circuit shown in the figure and bend the leads.
7. Apply the hot tips to the joints and apply the solder.
8. Remove the soldering tip and hold the resistor tightly until the solder has cooled and set.
9. Trim excess component lead with side cutter.
10. Repeat the above steps to fix the other resistor and capacitor.

DE-SOLDERING:

1. Place the tip of the soldering iron on the joints until the solder is melt.
2. Using de-soldering wick remove the molten state.
3. On the component side using tweezers remove the de-soldered components.

CONTINUITY CHECK:

1. Set the Multimeter in continuity check mode or resistor mode.
2. Place the two leads (common, +ve lead) in the two points to be checked.
3. If the resistance value is displayed as zero, there exists continuity.
4. Otherwise two points are not internally connected. (When set in continuity check mode, a beep sound is heard, if continuity exists between the two points)

RESULT:

Thus the soldering and de-soldering for the electronic circuit by assembling and disassembling in the Printed Circuit Board (PCB) is practiced and continuity check was also done.

EX.NO: 9 **DATE:**

ELECTRONIC ASSEMBLY AND TESTING WORK:

ASSEMBLING AND TESTING ELECTRONIC COMPONENTS ON A SMALL PCB.

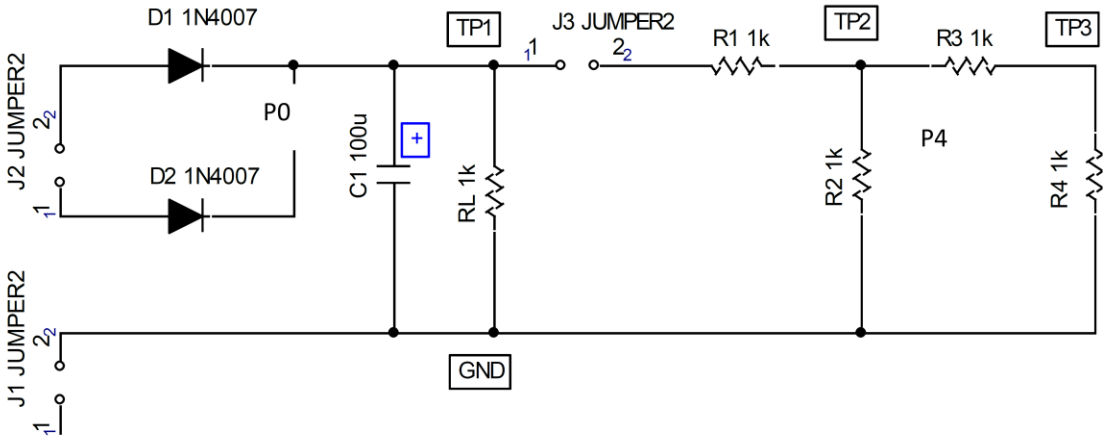
AIM:

To practice assembling and testing electronic components on a small PCB.

COMPONENTS REQUIRED:

S.NO	COMPONENTS NAME	VALUE	QUANTITY
1.	PCB for full wave rectifier and voltage drop resistive network	-	1
2	Digital multimeter (DMM)-	-	1
3	Resistors	1 kΩ ,500 Ω,10 kΩ,4.7 k, 2.2 kΩ, 22 kΩ	Each 1 no
4	AC power supply, connectingwires	-	1
5	soldering kit	-	1

CIRCUIT DIAGRAM:



PROCEDURE:

1) Assembling the circuit

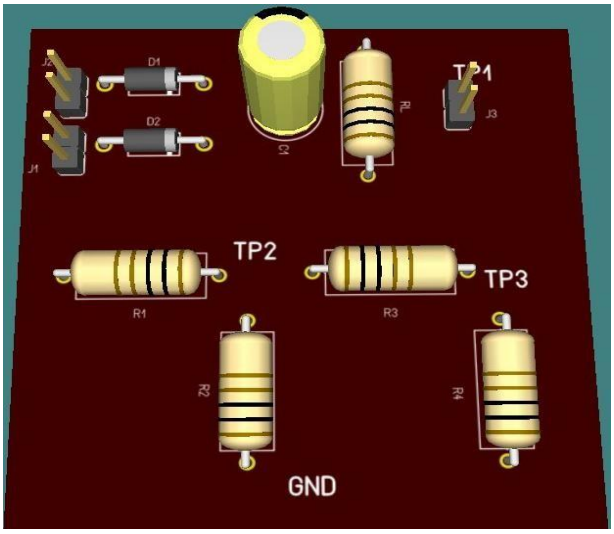
a) Assemble the circuit by placing the diode, capacitor, connector and resistors in the PCBas per the assembly diagram shown in the figure.

b) Bend the resistors lead to the appropriate size before inserting them into the board

c) Solder the resistor on bottom side of PCB board using soldering iron.

2) Testing the circuit

- Connect the AC source from step down transformer to jumper J1 and J2.



- Connect the positive terminals of multimeter to point TP1 and negative terminal to GND.

b) Measure the voltage V1 between TP1 and GND

JOIN JUMPER 3 THEN.

c) Measure the voltage V2 between TP2 and GND

d) Measure the voltage V3 between TP3 and GND.

V1	
V2	
V3	

e) Measure the voltage across the individual resistor and note the values in the table below.

Resistor	**Resistor value**	**Voltage drop across the resistor (v)**
R_L		$V(R_L)$ =
R1		V(R1) =
R2		V(R2) =
R3		V(R3) =
R4		V(R4) =

Calculate Vin=(V(R1) + V(R3) + V(R4))= + + + =---------V

Calculate Vout=($V(R_L)$)= ----- V

3) TROUBLE SHOOTING:

a) Set the digital multimeter the continuity mode. Unplug the device or switch off the circuit before attempting a continuity test. Check the continuity between all five nodes.

b) When the resistor value differs from the circuit, the output value also differs.

RESULT:

Thus the practice of assembling and testing electronic components on a small PCB has been successfully done.

EX.NO: 10 **DATE:**

STUDY AN ELEMENTS OF SMART PHONE.

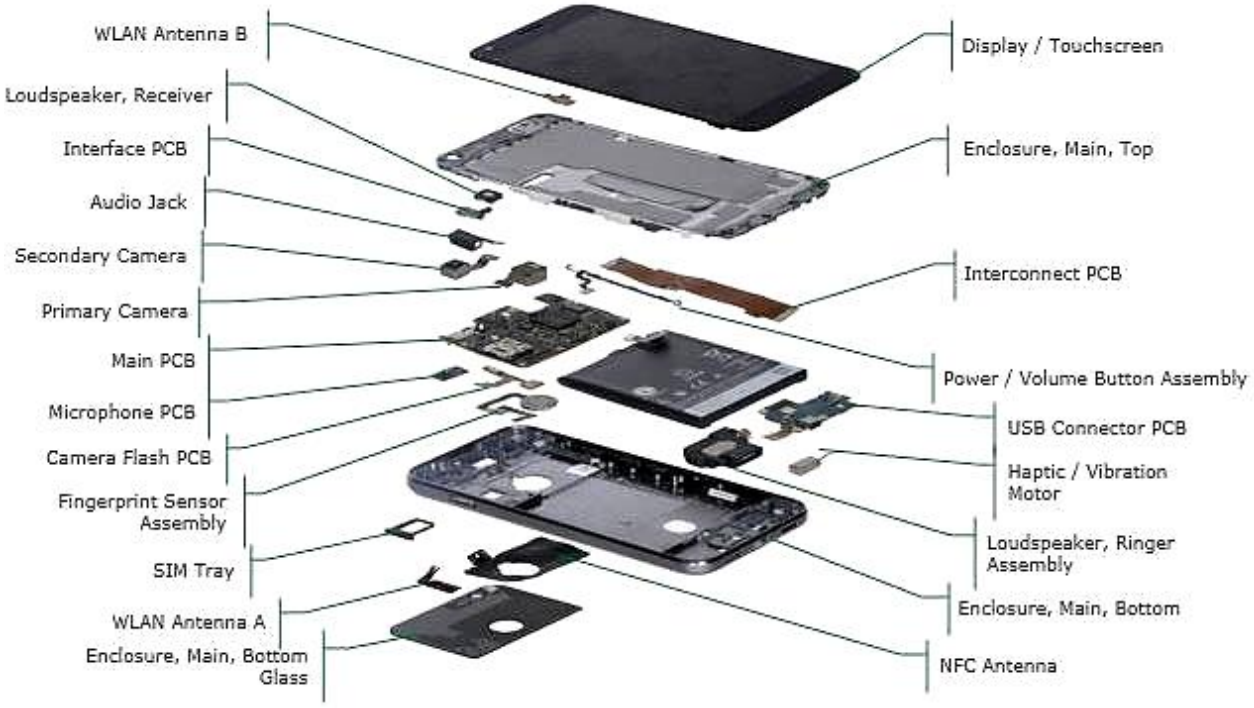
AIM:

To study the elements of a smart phone.

REQUIREMENTS:

1. Any smart Phone
2. Screwdriver Tool Kit

DIAGRAM:



- **Touch screen:**
  - The digitizer pasted to the front glass together is called as a "Touch Screen".
- **Display:**
  - The Display or The LCD (Bottom Layer) - The bottom layer which produces the image. The display is the visual component underneath the glass that displays the image on the screen.
- **Mobile enclosure (Top and Bottom):**
  - Mobile enclosure with easy to hold rounded design. Frame is made from extruded aluminum material, while the panel is ABS plastic.
- **PCB Interconnect:**
  - Male PCB Connectors are often referred to as Pin Headers, as they are simply rows of pins.
  - Female PCB Connectors can be called Sockets, Receptacles, or sometimes even Header Receptacles.
- **Power / Volume button assembly:**

Power button: It's usually a single button located along the top or right edge of the phone. Press and hold the power button to switch ON or OFF the smart phone.

Volume button assembly: Volume buttons are used to Slide the following volume levels

- Media volume: Music, videos, games, other media
- Call volume: Volume of the other person during a call
- Ring volume: Phone calls, notifications
- Alarm volume

- **USB connector PCB:**
  - Android smartphones have used the USB Micro-B connector for both data transfer and charging
- **Haptic / Vibration Motor:**
  - Haptics allow non-responsive surfaces like touchscreens to emulate the feeling of using real objects like buttons and dials. Haptic technology can involve vibrations, motors, and even ultrasound beams to simulate the feeling of touch.
- **Loud speaker, Ringer assembly:**
  - The loudspeaker is a small sound driver fitted within a mobile phone, or other communication device, which is used to produce sound. The loudspeakers on mobile phones are used to produce sound alerts for events such as incoming calls, incoming messages and alarms.
- **WLAN Antenna A:**
  - WiFi Antenna (WLAN antenna) is iate signal in air at specified frequency 2.4GHz or 5.8GHz through WiFi antenna/ WLAN antennas and allow other WLAN devices like NB or smartphone to get signal at same frequency range.
- **SIM tray:**
  - A small holder for a phone's SIM card.
- **Fingerprint sensor assembly:**
  - Fingerprint sensors are for added safety and security, and to easily identify users.
  - The two most common fingerprint sensors in use today are optical sensors and capacitive sensors.
- **Camera Flash PCB:**
  - The PCB (Printed Circuit Board) used to connect flash for mobile phone.
- **Microphone:**
  - The microphone at the bottom of your phone. Speak into the mic directly to be heard by others or to speak to your phone.
- **Primary camera: (Main Camera)**
  - It refers to the rear-facing camera system. The lens or lenses reside on the rear of the phone or within a backward facing pop-up camera module.
- **Secondary camera:**
  - This is the Selfie Camera - refers to the front-facing camera system. The lens or lenses reside on the front of the phone or within a forward facing pop-up camera housing.

- **Audio jack:**
  - A phone connector, also known as phone jack, audio jack, headphone jack or jack plug, is a family of electrical connectors typically used for analog audio signals.
- **Loud speaker:**
  - The loudspeaker is a small sound driver fitted within a mobile phone, or other communication device, which is used to produce sound. Traditionally, loudspeakers on mobile phones are used to produce sound alerts for events such as incoming calls, incoming messages and alarms.

RESULT:

Thus the elements of a smart phone were studied.

EX.NO: 11 **DATE:**

ASSEMBLY AND DISMANTLE OF LED TV.

AIM:

To assemble and dismantle the LED TV.

REQUIREMENTS:

3. LED TV
4. Screwdriver Tool Kit

Warning: This monitor contains electrostatically sensitive devices. Use caution when handling these components.

CAUTIONS:

1. Disconnect the monitor from the power source before disassembly.
2. Follow these directions carefully; never use metal instruments to pry apart the cabinet.

PROCEDURE:

Step 1: Inside the TV - Back View

- Removing some screws (Phillips) off the back panel allows it to be removed.

Step 2: Inside Board 1

- This is the power supply. The output voltages include 24V (Backlight), 12V (Control + Panel).

Step 3: Inside Board 2

- This is the main digital board of the TV. It controls all of the TV's functions.
- An interesting note: The service menu (Press Input then 3138 on the remote) has a factory reset option inside it, DO NOT ever use that. It will cause the display to malfunction, and you will have to trigger it again blindly to restore video output.
- The main IC is a MStar chip. The heatsink is poorly adhered to the IC with double sided thermal tape, which may lead to early thermal failure of the IC (seems to be common issue on Newegg forums, digital board failed).
- I glued the heatsink using some thermal RTV adhesive I got from eBay.
- The board has some I2C or Serial UART port on it, maybe it can be used? The USB can supply 5V.
- One cable supplies display data to the panel.

Step 4: Internal Board 3

- This is the display TCON (Timing Controller) board. It is considered to be part of the Innolux panel.
- This IC becomes very, very hot during operation and the provided cooling seems to be insuffificent. In order to make it possibly last longer, added some fans to this area and powered them off of the 12V from the mainboard.

Step 5: Internal Board 4

- This is the LED backlight's controller. The backlight seems to run on a fairly high voltage and the backlight cable is thus quite thin (right angle cable in the first image.) It is covered by plastic cover.
- The controller appears to be built using a bunch of MOSFETs and inductors as a boost/buck/current limiting DC-DC converter. The board is well-cooled with a lot of heavy copper fill areas, in my experience it does not need extra cooling to be okay
- Straight ribbon cable goes to TCON to allow backlight contrast dynamic dimming and control on/off/brightness.

Step 6: LCD Panel

- Model number of Innolux 3840*2160 panel. It can support 60p/60Hz if you replace the driver board with one from Alibaba I think, according to its datasheet.

Step 7: Speakers and Audio

- The speakers in the TV aren't really good so I won't elaborate too much. I have a calibrated EQ profile for them but I lost it, maybe will make another if there is demand.
- Port is tuned for ~300Hz
- PEQ (Parametric EQ) is built into the Service Menu of firmware.

Step 8: Debezeling modification

- The display can be debezeled by removing all screws from back, and then sliding the brackets to the side gently to release. Top side needs some prying to release. Border is 9mm after mod.

Step 9: Cooling fan and LED mods 1

- Added two 120mm computer fans and some LEDs to the back of the display
- Fans held by 3d printed brackets.
- Fans powered by unpopulated 'Panel VCC' pins on mainboard so they come on when TV is on. LM2596 buck converter used to reduce voltage for silent operation.
- LEDs powered similarly.
- If the board GND hard to solder to, you can just use extra screw to mount that wire to Chassis GND.

Step 10: LED mods 2

- 12Vcc and soldering the controller
- The controller IR remote and TV remote interfere with each other.

Step 11: Final Result

RESULT:

Thus the assembly and dismantle of LED TV has been done.

EX.NO: 12 (i) **DATE:**

ASSEMBLY AND DISMANTLE OF COMPUTER / LAPTOP.

AIM:

To assemble and dismantle of computer.

REQUIREMENTS:

1. Personal computer
2. Laptop
3. Screwdriver Tool Kit

THEORY:

- Computer assembly is a process in which all the internal components required for the computer system are fitted so as to make the computer functional.
- There is a proper sequence of attachment of each and every component into the computer system. To establish proper connectivity, one has to use the tools.
- Proper handling of tools is also required by the technician.
- It is required that students learn the steps of installation of each component.
- The main component involves installing CPU, motherboard, drives, video, graphics card, sound card, modem and adapter, and connectors, and system panel connector.

COMPUTER ASSEMBLY:

- Computer assembly is a systematic process. First, arrange the computer parts. The sequence for assembly and working of the computer listed below is as:
  - Open the case.
  - Install the power supply.
  - Attach the components to the motherboard.
  - Install the motherboard.
  - Install internal drives.
  - Connect all internal cables.
  - Install motherboard power connections
  - Connect external cables to the computer.
  - Boot the computer for the first time.

MATERIAL REQUIRED

- Computer case, with power supply installed
- Motherboard
- CPU
- Heat sink/fan assembly
- Thermal compound
- RAM module(s)
- Motherboard standoffs and screws
- Anti-static wrist strap and anti-static mat
- Tool kit

PROCEDURE OF ASSEMBLING PC:

Step 1: Open the case

- The first step in assembling a computer is to open the computer case (see Figure 1). There are different methods for opening cases.
- The computer comes with various types of cabinets. The method for opening the case is different based on the manufacturer.
- To open the case, first remove the screws of the left side cover and slide the side cover (see Figure 3).

Step 2 : Install the power supply

- When installing a power supply, make sure that all of the screws are used and that they are properly tightened.

Step 3: Attach the components to motherboard

- To prepare the motherboard, you first need to install the CPU, then the heat sink on the CPU and CPU fan.

CPU

- The CPU and motherboard are sensitive to electrostatic discharge. So place them on a grounded anti-static mat and wear an anti-static wrist strap while handling the CPU.
- When handling a CPU, do not touch the CPU contacts at any point. The CPU is secured to the socket on the motherboard with a locking assembly.

Heat sink and fan assembly

- Heat sink and fan assembly is a two-part cooling device.
- The heat sink draws heat away from the CPU.
- The fan moves the heat away from the heat sink.
- Connect the assembly power cable to the CPU fan connector on the motherboard.

Installation of RAM

- It is better to install the RAM first on the motherboard and then fix the motherboard in the case. To install RAM, first ensure its compatibility with the motherboard.
- Press down the side locks of the memory slot (see Figure 9). Align the notches on the RAM module to the keys in the slot and press down on both ends of RAM module until the side lock gets locked.

Step 4: Install motherboard

- Plastic and metal standoffs are used to mount the motherboard and to prevent it from touching the metal portions of the case.
- To install the motherboard, connect the 4-pin ATX power connector from the power supply to the motherboard.

Step 5: Install internal drives

Hard drive

- The hard drive is the device which stores all the data.
- Secure the HDD to the case using proper screws

Optical drive

- Insert the optical drive into the drive bay so that the optical drive screw holes align with the screw holes in the case (see Figure 14).
- Secure the optical drive to the case using the proper screws (see Figure 15).
- Connect the power cable coming from the SMPS to the power socket of optical drive.
- Connect SATA data cable from optical drive socket to the motherboard socket.

Step 6: Connect all internal cables

- Power cables are used to distribute electricity from the power supply to the motherboard and other components.
- Data cables transmit data between the motherboard and storage devices, such as hard drives.

Step 7: Install motherboard power connections

- Just like other components, motherboards require power to operate.
- Align the4-pin and 20-pin ATX power connector with the socket on the motherboard.

SATA power connectors

- SATA power connectors use a 15-pin connector
- Serial advanced technology attachment (SATA) power connectors are used to connect to hard disk drives, optical drives, or any devices that have a SATA power socket.

Step 8: Connect external cables to the computer

- Setting up the computer system involves the complete process of establishing the proper connectivity of various parts of the computer system — input and output devices, connectivity of computer with the surge power supply.
- Reattach the side panels to the case.
- The process of connecting the external cables given below:

Locate the monitor cable

- Locate the two power cable and one VGA cable or monitor cable (see Figure 21).
- The VGA cable is used to connect to monitor and another point on to the back side of the cabinet.
- If you are having trouble finding these, refer to the instruction manual of or the computer.

Connecting monitor

- Make sure the VGA cable plug aligns with the port, then connect it.

Connecting mouse

- If it uses a USB connector, plug it into any of the USB ports on the back of the computer.
- If it uses a PS/2 connector, plug it into the green mouse port on the back of the computer.
- In case of wireless mouse or keyboard, connect a Bluetooth dongle (USB adapter) in one of the USB ports of the computer.

Connecting headphones or speakers, and microphone

- Connect the external speakers or headphones, to computer's audio port (either on the front or back of the computer case).

UPS (uninterruptible power supply)

- While working on computer, its power supply should not be interrupted.
- UPS is like a power bank which gives power to the computer system.
- So make sure to plug power cable of monitor and cabinet into the UPS power output socket.
- Ensure the connection is proper.

Step 9: Starting the computer

C**OMPUTER** D**ISASSEMBLY**

- Disassembly is the process of breaking down a device into separate parts.

Procedure

The disassembly procedure of computer is demonstrated as below.

Step 1: Unplugging

- Unplug the power cord and all the peripherals attached to the computer, such as the keyboard, mouse, monitor, headphones, and any external drives.

Step 2: Open the case

- Pull the latch to release the side panel. Then lift the side cover out from the chassis.

Step 3: Disconnect all the connectors

- Disconnect all the connectors connected to the motherboard include SATA power cables and data cable of HDD.

Step 4: Remove the fan

- To remove the CPU fan from the heat sink, first, disconnect its connector from the motherboard. Then remove the four screws securing it (see Figure 44).

Step 5: Remove the power supply

- The power supply is connected to the motherboard by a 20-pin connector and 4-pin connector.
- Firstly, disconnect hard disk drive and the optical drive connectors from the motherboard
- Disconnect the power cable of the hard disk and optical drive which connects to the SMPS

Step 6: Removing HDD and optical drive

- Remove the SATA cable connecting to the HDD and motherboard.

Step 7: Remove RAM (random access memory) modules

- RAM allows for the transfer of information to and from the CPU.
- Computer runs fast with more RAM. Most computers have four RAM slots, and two RAM chips.
- It will cause the module to pop up for easy removal.

Step 8: Remove expansion cards

- The modern motherboards are integrated with the audio, video and network cards.
- However, if your computer has the expansion card as shown in Figure 54, insert into the expansions slot to increase the functionality.
- Carefully take out the card from the slot.

Step 9: Remove motherboard

- Every part of the computer is attached to the motherboard. The CPU, RAM, and expansion cards are directly attached to the motherboard.
- To remove the motherboard, disconnect all the cables from the motherboard.

Step 10: Reassemble the components

- Identify every component and take its photograph.
- After identification of each component, put all the components back in their place and ensure that all cables and wires are connected at the right place to avoid further troubleshooting.
- Close the case and put the screws back in their place.
- Lastly, connect every external device such as the keyboard, mouse, monitor, etc., and turn on the computer to see everything is working fine after assembled.

Result:

Thus the assembly and dismantle of personal computer were studied.

EX.NO: 12(ii) DATE:

ASSEMBLY AND DISMANTLE OF LAPTOP.

Aim:

To study the assembly and dismantle of laptop.

Requirements:

1. Laptop
2. Laptop repair tool kit (Precision Screwdriver Set)
3. Anti-static wrist strap
4. Magnifying glass

THEORY:

Assembling of Laptop:

Procedure

Step 1: Keep track of screws

Place these in small envelopes and write the component name on the envelope.

Step 2: Installation of processor

First component to be installed is the processor. Take extreme care not to touch the pins in the socket during the process (see Figure 57 and 58).

Step 3: Pop in the video card

- Hold the card at about a 30-degree angle as you insert its edge connector into the video-card slot near the center of the motherboard.
- Press the card in and downward, and then use the two small black screws to secure it in place.

Step 4: Set up the drive

- The motherboard SATA connectors are along the front, right edge, and under the lip of the laptop's shell.
- Drop the drive into place and then carefully use your thumb to push the drive into the SATA connectors.

Step 5: Add memory

- To install memory, locate the memory slots on the motherboard.
- Align the notches on the memory module with the ridge in the slot.
- Firmly push the module until the clips on the side of the slot snap into place.

Step 6: Final assembly

- Now that all the hardware components are installed.
- To prepare for power up, pop in the notebook's battery pack, connect the power brick and plug it into a wall outlet.

DISASSEMBLY OF LAPTOP:

Procedure

Step 1: Removal of battery

- Start the disassembly process by removing the battery (see Figure 59).
- Remove all the screws in the panel.

Step 2: Separation of palm rest

- Using a plastic case opener, separate the palm rest from the bottom case as shown in Figure 60.

Step 3: Removal of bottom case

- Turn the notebook upside down and remove the bottom case.

Step 4: Disconnecting the hard drive cable from the motherboard

- Remove the three screws fixing the hard drive bracket to the case.
- Disconnect the hard drive cable from the motherboard.

Step 5: Remove the hard drive

- Remove the hard drive assembly from the notebook.
- If you are going to replace it with another hard drive or SSD, you will have to transfer the mounting bracket and the SATA cable.

Step 6: Removal of RAM

- A notebook PC motherboard has two memory slots.
- Remove both RAM modules if necessary.

Step 7: Disconnection of cable

- Remove the one screw fixing the USB LED status board.
- Disconnect the cable from the motherboard.

Step 8: Removal of USB LED status board

- Remove the USB LED status board.

Step 9: Removal of screw fixing the optical CD/ DVD drive connector board

- Remove the one screw fixing the optical CD/DVD drive connector board. Disconnect the cable from the motherboard.

Step 10: Removal of the cooling fan

- Remove the two screws fastening the cooling fan to the case.
- Unplug the fan cable from the motherboard and remove the cooling fan (see Figure 68).

Step 11: Removal of DC power jack

- In PC, the DC power jack is mounted under the hinge. Remove it.
- Disconnect the Wi-Fi antenna cable from the wireless card. Disconnect the DC power jack harness from the motherboard.
- Open up the hinge and remove the DC power jack.

Step 15: Removal of screw securing the board

- The power button board is also mounted under the same hinge.
- Remove the one screw securing the board and unplug the cable from the motherboard.

Step 12: Removal of motherboard

- Separate the motherboard from the top case and remove it.

Laptop LCD Screen Removal

Procedure

- It is possible to disassemble the LCD screen of a laptop independently. Previous steps are not required for disassembling the display, you only need to disconnect the battery before you start.

Step 1: Separate the display bezel from the back cover. You will have to wiggle the bezel to unfasten it from the cover. Start on the top and move to the sides for the display assembly.

Step 2: On the bottom, the bezel is attached to the LCD screen with adhesive tape. Carefully separate it from the screen.

Step 3: Remove the bezel completely.

Step 4: Remove the four screws securing the LCD screen to the side brackets

Step 5: Separate LCD screen from the back cover and place it the front side down on the keyboard.

Step 6: Now you can access the video cable connector

Step 7: Peel off the grounding tape from the screen.

Step 8: Peel off the clear tape securing the connection and unplug the video cable from the screen.

Step 9: Remove the LCD screen completely and replace if necessary

Step 10: You can find a new LCD screen using the model number from the original one.

RESULT:

Thus the assembly and dismantle of Laptop has been done successfully.