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LEARNING OBJECTIVES

It is essential for the students to know, how the electrical energy is being utilized in heating appliances. The main objective of this chapter is to make students, to understand the working of various heating appliances through the types of conductive methods.

Furthermore, this lesson also aims to aid the students, to gain practical experience about defects, their reasons and its corrective measures of the heating appliances.

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U	E J		
		7.1	Introduction
		7.2	Electric iron box
		7.3	Induction stove
		7.4	Bread toaster
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		7.7	Geyser
		7.8	Energy consumption of appliances

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Electric Heating Appliances



Electricity plays major role in our everyday life. One of the main application of electricity is to produce heat from heating elements. In this chapter, we shall learn about the types of heaters and its working procedure such as Electric iron box, Induction stove, Bread toaster, Coffee percolator and Electric geyser.



An Electric iron box is an appliance used to remove the wrinkles in the clothes when heated. It is of three types.

- i) Non-Automatic or Ordinary type iron box
- ii) Automatic iron box
- iii) Steam automatic iron box

a) Clothes and its temperature

The operating temperature of the iron box for different type of cloth is tabulated below

Nylon - 70°C -90° C Rayon - 100°C - 120°C Silk - 130°C - 150°C Wool - 160°C - 180°C Cotton - 200°C - 220°C Linen -230°C - 260°C

According to the range of heat required to clothes, the thermostat can be fixed and the wrinkles were removed from the washed clothes.

b) Power cord

The electric conductor that permits electric supply to an electric appliance will contain three terminals such as Phase (Red color), Neutral (Black color) and Earth (Green). The electrical conductors coiled with cotton threads are the most commonly used power cords.

7.2.1 Non-automatic or ordinary type iron box

As shown in fig. 7.1 the non-automatic or ordinary type iron box is an appliance, where we control the heat of the appliance by simply putting the switch 'ON' and 'OFF' only according to the types of cloth used.





The main parts of the iron box are listed below

a) Handle

Handle is made up of Bakelite a hard type of plastic in the iron box. Bakelite is having resistive power of heat and nonconductor of electricity. A rubber tube is provided at the top of the handle, to avoid the damage of power cord while in use.

b) Top cover

Top cover is at the top of the appliance and it covers all the inner parts

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of the appliance. It is made of metal which is chromium plated to look attractive.

c) Stand

Stand is made up of strong iron to make the appliance to keep stand when not in use.

d) Pressure plate

Pressure plate is made up of hard cast iron and it gives weight to the appliance. Due to this, the wrinkles in the clothes are removed.

e) Mica sheet

Mica is an insulator of electricity. It is kept top and bottom of the heating element for safety purpose. Mica is also good to resist the heat.

f) Heating element

The heating element of the iron box is made from mixed alloy of Nichrome. Usually, in all the heating appliances, it is used as heating element. The heating element here used is of ribbon type.

Heating element is of two types.

1. Coiled type and

2. Ribbon type.

g) Sole plate

Sole plate is plated with chromium and made up of cast iron. The bottom of the sole plate is surface grained for smoothness.

Working principle

The power cord of the iron box is connected to the main supply. The electric energy is converted into heat with this heating element. The heating element is

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having the property of high resistivity. According to the law of conservation of energy the heat energy produced is proportional to the square of current without any loss. This heat energy makes the sole plate to get hot and with that the wrinkles in the clothes are removed.

In this type of iron box, according to the type of clothes, the heat can be controlled manually, by connecting or disconnecting the supply through switch.

7.2.2 Automatic iron box

In an automatic iron box, the temperature of the clothes can be selected to the required quantity of heat. The temperature is controlled by the thermostat in the appliance automatically. Hence this appliance is called as Automatic iron box.



Fig 7.2 Electric Automatic iron box

a) Construction

As shown in fig. 7.2, the construction and operation of automatic iron box is similar to that of an ordinary iron box. In an automatic iron box, the temperature is controlled with the help of thermostat. The Thermostat is a bi-metallic strip. In addition to this, an

indicating lamp is connected in series with the heating element.

b) Indicating lamp

In the iron box LED lamp is used as an indicating lamp. Indicating lamp is provided to know whether the supply is in the appliance or not. During the time of supply only, the indicating lamp will glow. After attaining the fixed level in the regulating knob (or) selector knob the indicating lamp turns off automatically. This shows the availability of supply in the appliance.

c) Thermostat

Thermostat is a bi-metallic strip made up two different metals. Generally, during heat, the metals get expanded. After setting the required value in the regulating knob, the heat increases gradually and gets saturated. Then the bi-metallic strip will bend automatically and stop the supply to the heating element. This can be viewed in the fig 7.3.



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Fig 7.3 Thermostat in closed position

After the heat gets reduced in the sole plate, the bi-metallic strip, again contacts with electric supply and makes the appliance to get heated as shown in fig. 7.4.

The expansion of the strip will vary, according to the strip which the bi-metal was made.







d) Working principle

The electric input is given to the iron box by putting the switch in ON position. The current goes to the heating element of the iron box through power cord. The heating element gets heated up due to its heat production property. The heat was absorbed by the sole plate and gets heated gradually. This heat removes the wrinkles in the clothes.



7.2.3 Steam iron box

Fig 7.5 Steam iron box

The construction and working principle of a steam iron box is similar to that of Automatic iron box. The internal construction is shown in fig. 7.5.

A steam iron is an electric iron A steam iron is an electric iron that produces steam from water. The steam removes the wrinkles in the clothes. It is fitted with thermostat with wattage of around 1000 to 1600 watts. Steam ironing is one of the easiest method to iron the clothes. For the removal of the wrinkles from the clothes and ironing this type is the best. The steam iron requires more duration to get heated when compared with other types.

In this, a small water container is kept above heating element and it supplies water to sole plate through the holes provided in it. The water steam flow is controlled by a press valve kept near the handle. The valve control is provided in handle in order to control the water flow easily. The valve will not allow the water or steam to back side. The water in the tank comes through holes in sole plate in the form of steam. Once the valve gets opened, the steam reaches the cloth and the wrinkles in the cloth will be cleared. The flow of steam upon the position of the knob is kept in it. Any defects in the heating element may cause the unit to be replaced by a new one.

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a) Maintenance

- 1. In steam iron box, distilled water only be used.
- 2. After the use of iron box, the water in the container should be removed completely with the help of steam control valve.
- 3. The salt deposits inside the iron box should be cleaned with the help of vinegar. The vinegar is mixed with water and is rinsed inside two or three times to clear the salt depositions in it.

S.No.	Defects	Reasons	Remedies
1	Iron box not gets heated.	 No electric supply. Heating element is not connected with supply. Loose connection in heating element. 	 Correct the electric supply. Connect the supply to the heating element properly. Heating element should be connected properly.
2	Heat produced in the iron box is not adequate.	 Voltage drop. Thermostat knob not fitted properly. Loose connection in thermostat. 	 Correct the voltage. Proper fitting of thermostat knob should be done. Thermostat connection should be done properly
3	Heat produced is exceeding the setting point kept.	1. Short circuit in Thermostat.	 Short circuit in thermostat is corrected. Emery sheet should be used for cleaning the terminal ends to avoid short circuit.
4	Clothes are sticking in the sole plate while ironing.	 Abnormal heat produced. Due to that thermostat terminals contact with one another. Bottom of the sole plate is corroded. 	 Terminals of thermostat should be connected correctly. The corrosion in the sole plate should be cleaned by applying non corrosion things.
5	Iron box is getting electric shock.	1. Supply wire may contact with body of the iron box.	 Connect the supply wire without touching the metal parts of the iron box. Earth connections should be properly checked.

7.2.4 Trouble shoot chart

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Fig 7.6 Induction stove

Induction stove is widely used in places where there is not having LPG gas connection facility. Induction stove is commonly used in hospitals and temporary exhibitions. The construction is shown in the fig. 7.6. This type of stove has no smokes and flames. The utensils kept over the induction will not get much heated. Only the things kept inside the utensil alone gets heated. Now-a-days, these type of stoves are widely used in Asia, Europe and America.

Induction heating is the process of heating an element or appliance electrically by the principle of electro magnetic induction. The heat is generated in this type of stove is by means of the eddy currents produced in the induction coils.

The types of the Induction stove are classified as

- a) Single type
- b) Dual type and
- c) Four type

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7.3.1 Construction

Induction stove is made up of noncorrosive stainless steel. Heating element is fixed on the top of the stove, in which utensils were kept. Three pin plugs are used as supply terminal in this stove. Rubber bush is kept at the bottom of the stove for grip. In this, various facilities like child lock safety, timer, temperature indicator and cooking options were included.

7.3.2 Working principle

An alternating supply is made to flow through the resonant coil, which leads to the generation of oscillating magnetic field. The magnetic field induces an electric current inside the cookware. The induction cook top works with cookware made of certain materials which have specific properties. The Induction stove transfers electrical energy by induction from a coil of wire into a metal vessel that must be ferromagnetic. The coil is mounted under the cooking surface, and a high frequency of alternating current is passed through it. The current in the coil creates a dynamic magnetic field. The magnetic field induces whirling electrical eddy currents inside the pan, turns into heat. Heat from the pan flows directly into the food or water kept inside the container, and by conduction method it gets heat.

High production of heat is the specialty of this stove. No heat losses will occur. This type of stove can be used in all climatic condition.

7.3.3 Advantages

- i) Function is faster than other types of stoves.
- ii) Easy to clean.
- iii) Stains produced in this can be easily cleaned with cloth.

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- iv) Cost is less.
- v) No noise occurs while functioning.
- vi) Burns or wounds will not be caused when touched.



A Bread toaster, or a toast maker, is an electric small appliance designed to toast sliced breads by exposing it to radiant heat, thus converting it into toast. It is portable device and easy to carry.

7.4.1 Types

The most common household toaster is classified as

- i) Ordinary type bread toaster, and
- ii) Automatic type.

Ordinary type of bread toaster is not used in now-a-days.

7.4.2 Automatic bread toaster

a) Construction

Electric bread toaster looks like a rectangular box and is used for toasting the bread slices as shown in fig. 7.7. In this, two gaps are provided, in which two bread slices are put for toasting. The gap is adequate for bread slices to go inside.

b) Working principle

The bread slices are kept in the place of bread resting container, and put the lever down to make the bread slices to get in. Then close the top of the toaster with lid, and allow the supply to get toasted. After the bread slices gets toasted, the thermostat which is connected in series with electric supply disconnect the supply and pushes the lever up. Now the toasted slices came out with golden colour.



Fig 7.7 Bread toaster

three Bread toaster contains heating elements and they are in front, middle and back side of the toaster. The centre heating element is the main element for toasting. A resting thick sheet is kept inside the toaster and is attached with a lever. A Thermostat, the heat control device is connected in series with heating element and to the supply. Three pin power cords are used as supply wire for the appliance. Handle is made of hard plastics which insulates the heat and electric supply. A tray is kept below the toaster, in order to collect the waste particles of bread.

The use of Thermostat is to allow and disconnect the power supply when the toaster is not in use.

7.4.3 Timer switch

Timer switch is a safety switch for the bread toaster. It limits the electric supply and saves electric energy.

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S.No.	Defects	Reasons	Remedies
1	Supply is given, but the toaster not functioning	 There may be open circuit or short circuit in the power cord. The supply terminals not connected with heating element. 	 Open circuit or Short circuit in the power cord should be checked before giving the supply. Connect the terminals of the heating element correctly.
2	Getting electric shock while using the toaster	Electric supply terminal is contacting with metal parts of the toaster.	The contact of supply terminal on the metal part should be properly insulated.
3	When switch is 'ON', the fuse gets melted	Short circuit in the toaster.	Short circuit should be identified and gets rectified.

7.4.4 Defects, reasons and remedies of electric bread toaster



A microwave oven is an electrical appliance that heats and cooks food by exposing it to electro magnetic radiation. The topics covered are:

- 1. Introduction
- 2. Types
- 3. Components
- 4. Working principle

1 Introduction

Microwave oven is a home appliances for commonly used cooking a variety of foods and reheating the previously cooked. Microwave oven heats the food with microwaves, which is in a form of electro magnetic wave similar to radio waves. 15:10

A magnetron is a device inside

the oven produces microwaves. The microwaves reflect the interior of the oven

and causes the water molecules in food to



Fig 7.8 Microwave oven

vibrate. This vibration results in friction between molecules, which produces heat that cooks the food.

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2. Types

Three types of microwave oven are:

- a. Solo microwave oven
- b. Grill microwave oven
- c. Convection microwave oven
- (a) Solo microwave oven



Fig 7.9 Solo microwave oven

The fig 7.9 shows the solo microwave oven. The solo model are the basic used model in micro wave ovens. In this type, the magnetron inside produces micro waves and it can do heating and boiling. It cannot perform the roasting and baking.

(b) Grill microwave oven



Fig 7.10 Grill microwave oven

The fig 7.10 shown grill type, the micro wave ovens are provided with heating coils. In this, the oven is heated by coils induce a grilling or roasting process. It creates browning on the surface of the food particle.

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(c) Convection microwave oven



Fig 7.11 Convection microwave oven

The main parts of convection microwave ovens are a heating element to create heat and to circulate the air within the oven.

3. Components

The main components of the microwave oven are

- a. High voltage transformer
- b. High voltage capacitor
- c. High voltage diode
- d. Cavity magnetron
- e. Micro controller
- f. Wave guide and
- g. Cooling fan.

a. High voltage transformer





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The microwave oven requires more power than the normal voltage taken by the domestic electrical wiring. A step-up transformer with a high-voltage output is placed inside the oven to fulfil this. The input 230 V power source is increased to a high voltage before being fed to the cavity magnetron.

b. High voltage capacitor

High voltage capacitor is connected with the transformer and magnetron through diode. It automatically charged and discharged when required and delivers high energy to the magnetron as shown in fig 7.13



Fig 7.13 High voltage capacitor

c. High voltage diode

High voltage diode is used in the microwave oven for protecting them from high voltage.



Fig 7.14High voltage diodeBasic Electrical Engineering — Theory

d. Cavity magnetron



Fig 7.15 Cavity magnetron

Another component in a microwave oven is cavity magnetron, which is a high-powered vacuum tube that converts electrical energy into long-range microwave radiations.

e. Microcontroller



Fig 7.16 *Microcontroller*

A microcontroller is a device which allows communication between a user and a machine. It is a controlling unit with one or more processing cores, memory, and programmable input or output peripherals. It processes the user's instructions and displays them on a seven-segment display or an LED screen, depending on the model of the oven.

4. Working principle

Microwave ovens work on the principle of electro magnetic energy converted into thermal energy. Electro magnetic energy refers to the radiation of electro magnetic

Wave guide Wave guide Magnetron Fan Power supply Base plate

Fig 7.17 Main parts of microwave oven

waves comprising an electrical field and magnetic field, oscillating perpendicular to each other. When a polar molecule, falls in the path of electro magnetic radiations, and oscillates to align equally.

Due to molecule friction and collision, energy is lost from the dipole, resulting in heating. The water molecules present inside the food products contact with microwave radiations, by heating the food.

7.5.1 Advantages and disadvantages of microwave oven

Advantages

- 1. Cooking time is short
- 2. Destruction of nutrients is less
- 3. No physical change of foods
- 4. Melting process is easy

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Disadvantages

- 1. Constraint is there with metal container
- 2. Heat force control is difficult
- 3. Water evaporation (Dehydration) occurs
- 4. Uneven cooking (hot and cold spots) takes place
- 5. Surface toasting is impossible

7.5.2 Energy rating

The energy efficiency of microwaves does not vary more. A small microwave, rated at 600-800 watts, is generally more energy-efficient than a larger one, rated at 850-1650 watts.

7.5.3 Precautionary steps followed while using microwave oven

1. For all electrical appliances, it is important to follow the instruction specified in the manual for operation with safety precautions.

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- 2. Use microwave safe cookware which has been specially designed.
- 3. If the door of the oven is opened or bent or broken the appliance wont works.
- 4. Standing before the oven is not advisable when it is in use.
- 5. Liquid materials should not be heated over a specified temperature. It will cause condensation and affect the life of the oven.



Water is heated through electric supply, and that hot water is mixed with coffee powder, coffee water is prepared. This appliance is called coffee percolator.

Coffee percolator is divided into two types.

- 1. Ordinary or Non-automatic type coffee percolator
- 2. Automatic type coffee percolator

7.6.1 Parts

The main parts of coffee percolator are listed below:

- 1. Heating element
- 2. Cylindrical shape body
- 3. Water container
- 4. Vertical tube or Percolating tube
- 5. Coffee basket
- 6. Top cover
- 7. Container for coffee water
- 8. Outlet for coffee water
- 9. Handle

7.6.2 Construction

Coffee percolator is portable device as shown in fig. 7.18. In this, the coil is made up of Nichrome and is used as heating element. Because of its high resistance in the coil, the electrical energy is converted into heat energy. The appliance is cylindrical in shape and is made up of iron coated with lead. Water is poured into the container. A coffee basket is kept above the vertical tube. In some appliances, the lid is made up of glass. In certain type of coffee percolator, separate chamber for hot water and coffee water are provided. Handle is made up of non-conductive materials like Bakelite, which resists heat produced in it.

7.6.3 Working principle





First the percolator lid is opened, and water is poured inside, through the percolating tube. Coffee powder is poured to the required quantity in the coffee basket and close the lid. If the supply is given, the water in the container gets heated and the steam of the water goes towards percolating tube, and soaks the coffee powder in the basket. Now the essence of coffee water is collected from the bottom of the container through a tap. Any leakage or holes in the tube, this percolator will not function.

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A geyser is a heating appliance which is used in the places where hot water is required. Normally tubular type of heating element is used in this appliance. Nichrome is the heating element used in all heating appliances. Due to the high resistance in the heating element, the electrical energy is converted into heat energy, and the water gets heated. Thermostat, in the appliance regulates the heat produced in it.

The geyser is available in various rating of 15, 25, 35 and 50 litres and is also available from 1000 to 5000 watts.

7.7.1 Construction

1. Container

Geyser is an appliance used for getting a huge quantity of hot water and is for domestic purposes. It is cylindrical in shape and contains two containers such as

1. Inner container

2. Outer container.

Inner container is made up of brass and is coated with lead to avoid corrosion. Outer container is made of steel coated with paint. In between the inner and outer container a glass wool is used to protect the hot water from the outer atmosphere and moisture. Also, it prevents the hotness from inner container to outer container.

2. Water inlet pipe

The inlet pipe is provided to allow the water to go inside the inner container.

A valve is fixed to regulate the flow of water into it.

3. Water outlet pipe

Outlet pipe is the pipe used for collecting the hot water from the geyser. The outlet pipe is bent on the top, in order to collect hot water uniformly.

4. Heating element

Tubular type of heating element is used as a heating element. Nichrome, the mixed alloy, is used as a heating element in all heating appliances.

5. Thermostat

Thermostat is a bi-metallic strip used to control the heat and is connected in series with the heating element to get the determined value of heat fixed in the setting position.

6. Vent pipe

When we want to shift the geyser or replace the heating element, the water in the geyser is to be removed completely. During that time, this vent pipe is used to drain the water inside the container.

7. Pressure release valve

In order to release the pressure inside the geyser from explosion, pressure, release valve is used. Also, it maintains the level of water inside the container.

8. Positive plate

The positive rod itself accepts the corrosion produced and preserves the steel container from corrosion.

Geyser is of two types. They are

- i. Non pressure type geyser and
- ii. Pressure type geyser

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7.7.2 Non pressure type geyser

Non pressure type geyser is used in places where small quantity of hot water is required.



Fig 7.19 Non pressure type geyser

a) Working principle

When an electric supply is given to the geyser, the electrical energy makes the heating element to get heated gradually. The conversion of electrical energy into heat energy is due to Nichrome, which is having a very high resistance value. Now the heat conducts water and makes it hot. The setting position of thermostat automatically stops the electrical input in the appliance. After the heat gets reduced, the thermostat immediately connects with electric supply and makes the water again to get heated. The density of hot water is lesser than cold water. Hence the hot water is on the top and cold water in the bottom of the geyser.

7.7.3 Pressure type geyser

For requirement of large quantity of hot water, in a multi-storied building,

pressure type of geyser is used. In this type, the water in the appliance is controlled by float valve.



7.20 *Pressure type geyser*

The working principle of this type is similar to that of non-pressure type geyser. In this water pressure is controlled by a floating valve. Being the outlet pressure is high, this type of geyser is used in multi-storied building for getting hot water. This type of geyser is fixed in one place and hot water can be collected in various rooms.

C **7.8** ENERGY CONSUMPTION OF APPLIANCES

The best way to compare the cost of running different appliances is to look at their energy consumption, which is a measure of how much energy they consume in Watts.

In our house, the consumption of home appliances are given below.

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SI No	Advantage	Power	Usage of time	Consumption/ year
1	Iron box	750w – 1000 w	5 hrs/week 48 weeks	260 Kwh
2	Induction stove	1500 w	1.5 hrs/day 365 days	821 kwh
3	Water heater	1000 – 2000 w	30 min/days 240 days	180 Kwh
4	Coffee percolator	500 – 1000 w	10 min/day 335 days	42 Kwh
5	Microwave oven	2000 – 2500 w	1.5 hrs/week 48 weeks	162 Kwh
6	LED television	20 – 60 w 0-3 sleepy mode	4 hrs/day 335 days	54 Kwh 2.2 Kwh (sleepy mode)
7	Washing machine	2500 – 3000 w	4 hrs/week (0.9 Kwh/cycle) 48 weeks	173 Kwh
8	Refrigerator	150 – 200 w	365 days	220 Kwh
9		60 w – 70 w	12 hrs/Day 365 Days	263 Kwh
10	Mixer grinder	750 w	20 min/day 365 days	90 Kwh
11	Wet grinder	150 w	40 min/day 40 weeks	21 Kwh
12	1HP motor pump	746 w	30 min/day 365 days	136 Kwh

GLOSSARY		
Pilot lamp	_	அறிகுறி விளக்கு
Thermostat	_	வெப்ப நிலைப்பி
Bi-metallic strip	_	ஈருலோகத் தகடு
Pressure release valve	_	அழுத்தம் அகற்றும் வால்வு
Induction stove	_	தூண்டல் அடுப்பு
Geyser	_	நீர் சூடேற்றும் கலன்

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PART A

Choose the correct answer:

- 1. Which is not connected with heating appliances?
 - a. Electric stove
 - b. Electric iron box
 - c. Room heater
 - d. Electric fan
- 2. In which appliance, a small water tank is kept over the heating element.
 - a. Pressure type geyser
 - b. Steam iron box
 - c.Coffee percolator
 - d. Electric soldering iron
- The use of control valve in an electric steam iron box is to

 a. prevents water and steam not to
 go top
 - b. control water alone
 - c. control steam alone
 - d.control heat alone
- 4. What type of water can be used in steam iron box?
 - a. Ordinary water
 - b. Hot water
 - c. Cold water
 - d.Pure distilled water
- 5. Mica sheet is a
 - a. non-conductive material
 - b. non-resistive to heat
 - c. conductive material
 - d. easily combustible



6. Which metal, the heating element is made up of?

Mark 1

- a. Brass
- b. Nichrome
- c. Aluminium
- d. Copper
- 7. Due to_____, the electric energy is converted into heat energy
 - a. low electric supply
 - b. low resistance
 - c. high resistance
 - d. high electric supply
- 8. The ratio of heat in heating appliances is
 a. I²Rt
 b. I²R²t
 c. IR²t
 - d. IRt²
- 9. _____is used in indicating lamp.
 - a. Incandescent lamp
 - b. Light Emitting Diode lamp
 - c. Tube light
 - d. Compact fluorescent lamp
- 10. The appliance which induces hot waves from electromagnetic field is
 - a. Electric iron box
 - b. Hair drier
 - c. Induction stove
 - d. Electric kettle

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- 11. According to_____, induction stove will function

 a. Law of conservation of energy
 b. Ohms law
 c. Flemings rule
 d. Faraday's law
- 12. How many bread slices are toasted in a bread toaster simultaneously?
 - a. 2 b. 3 c. 4 d. 5
- 13. In heating appliances, thermostat is connected in _____
 - a. series
 - b. parallel
 - c. series parallel
 - d. earth
- 14. Use of percolating tube in coffee percolator isa. to get coffee water
 - b. outlet for steam
 - c. to get hot water
 - d. to store coffee powder

- 15. To avoid corrosion in an inner container of geyser ______ coating is used
 a. Lead b. Chromium
 c. Nickel d. Copper
- 16. Use of glass wool in geyser is
 - a. to retain the water hotness as it isb. to retain the water chillness as it isc. to get more heatd. to get less heat
- 17. The use of fusible plug in geyser is to
 - a. increase pressure
 - b. release pressure
 - c. get more heat
 - d. get less heat

PART B

Mark 3

Answer the questions in briefly

- 1. State the types of electric iron box.
- 2. What is the use of small water tank in steam electric iron box?
- 3. What is the use of control valve in steam electric iron box?
- 4. State the maintenance tips of steam electric iron box.
- 5. What is the use of pressure plate in electric iron box?
- 6. What is the use of sole plate in electric iron box?

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- 7. State indicating lamp.
- 8. What is induction stove?
- 9. What are the uses of induction stove?
- 10. Define bread toaster.
- 11. Define microwave oven.
- 12. Mention the parts of the microwave oven.
- 13. List the types of microwave oven.

- 14. What is the use percolating tube in coffee percolator?
- 15. What is coffee percolator?
- 16. State geyser.
- 17. Write down the types of geyser?
- 18. What is the use of fusible plug in geyser?

PART C

Mark 5

Answer the questions not exceeding one page

- 1. Explain the functions of thermostat in an electric steam iron box.
- 2. Tabulate the troubles, reasons and remedial measures of an electric bread toaster.
- 3. Explain advantages and disadvantages of microwave oven.
- 4. What is the safety precaution to be followed while using micro-wave oven?
- 5. Draw and explain the construction of coffee percolator.
- 6. Explain the pressure type geyser.

Mark 10

Answer the questions not exceeding two page

- 1. Draw and explain the construction and working principle of an electric steam iron box.
- 2. Tabulate the defects, reasons and remedial measures of an electric steam iron box.
- 3. Explain the construction and working principle of an electric induction stove with suitable sketch.
- 4. Explain the construction and working principle of an electric bread toaster with sketch.

- 5. Explain types of microwave oven and its working principle.
- 6. Explain the construction and working principle of an electric coffee percolator with sketch.
- 7. Explain the construction and working principle of pressure type geyser with neat diagram.
- 8. Explain the construction and working principle of non-pressure type geyser with neat diagram.

Reference books

1. 'A text book of Electrical Technology' Volume II and Volume III by B.L. Theraja and A.K. Theraja, S. Chand & Company Ltd.

PART D