COVER PAGE

TROUBLESHOOTING & MAINTENANCE OF ELECTRONIC EQUIPMENT (790)

Marking Scheme

Class XII - 2018-19

Time: 2 $\frac{1}{2}$ Hours **Total Marks: 50**

General Instructions:

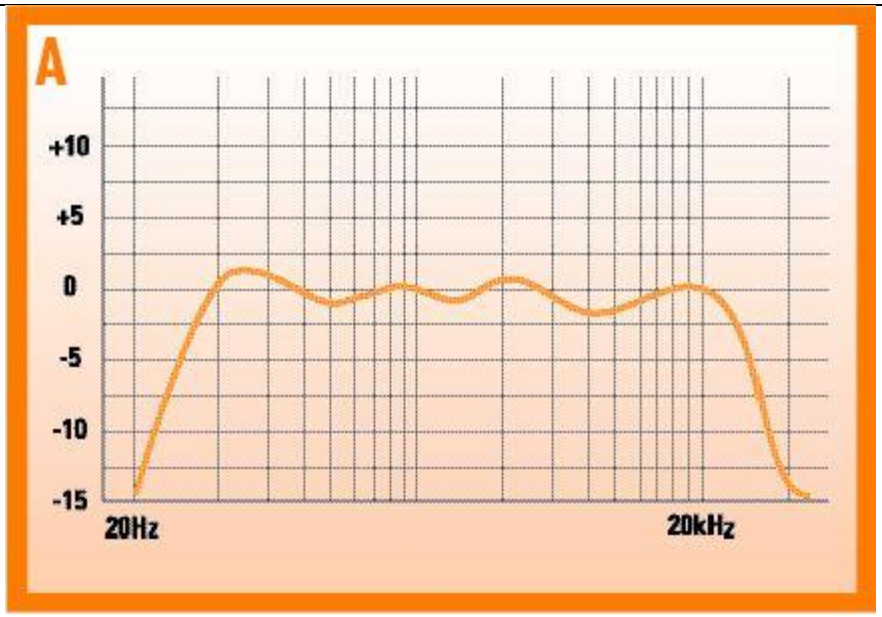
1. *Marking Scheme is divided into two sections: Section-A and Section- B.*
2. ***Section–A:***
   - ***i.*** *Multiple choice question/Fill in the blanks/Direct Questions of 1 mark each. Answer any 10 questions out of the given 12 questions.*
   - ***ii.*** *Very Short Answer of 2 marks each. Answer any 5 questions from the given 7 questions.*
   - ***iii.*** *Short Answer of 3 marks each. Answer any 5 questions from the given 7 questions.*
3. ***Section–B:****Long/Essay type questions of 5 marks each. Answer any 3 questions from the given 5 questions.*
4. *All questions of a particular section must be attempted in the correct order.*
5. *Pleasecheck that this question paper contains 31 questions out of which 23 questions are to be attempted.*
6. *The maximum time allowed is* $2\frac{1}{2}$ *hrs.*
7. *The marking scheme carries only suggested value points for the answers. These are only guidelines and do not constitute the complete answers. The students can have their own expression and if the expression is correct, the marks be awarded accordingly.*

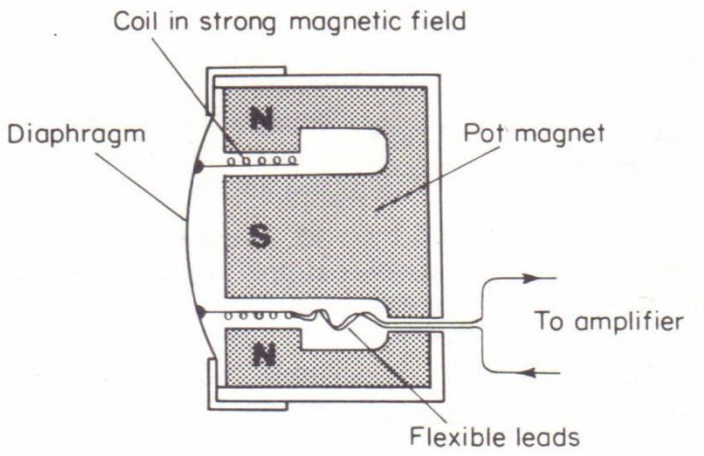
TROUBLESHOOTING & MAINTENANCE OF

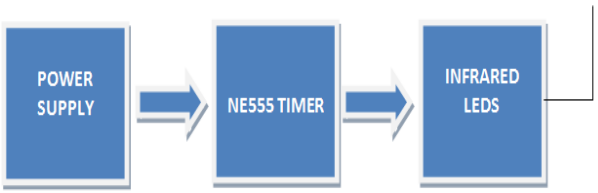
ELECTRONIC EQUIPMENT (790)

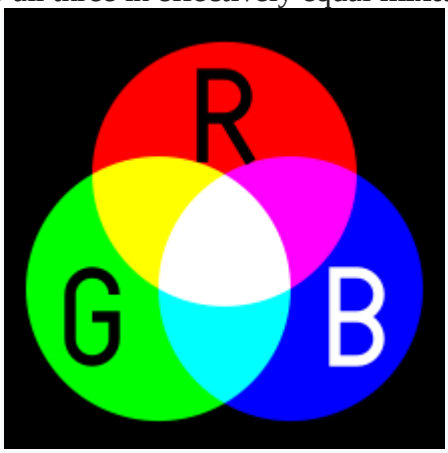
Q.NO.	Expected Answer/Value Points	Marks	Total Marks
1	(a) To and fro	**1**	**1**
2	(a) Electromagnetic induction	**1**	**1**
3	(a) Ohm	**1**	**1**
4	(d) 120mm	**1**	**1**
5	(a) Infinite baffle	**1**	**1**
6	(c) Outermost track	**1**	**1**
7	(b) AC voltage	**1**	**1**
8	(a) Roll up and down	**1**	**1**
9	(c) Current Tracer	**1**	**1**
10	(d) Multitrace Oscilloscope	**1**	**1**
11	(b) Dual Tone multiple frequency	**1**	**1**
12	(c)tuner	**1**	**1**
13	Advantages: 1. It is available in desired shape. 2. It has rugged construction. 3. It is small in size. 4. It has good frequency response. 5. It has negligible phase shift. **Applications** o The piezoelectric transducer is used in spark ignition engines. o It can be used in electronic watches. o It is used in accelerometer. o It is used in record player.	**2**	**2**
14		**2**	**2**

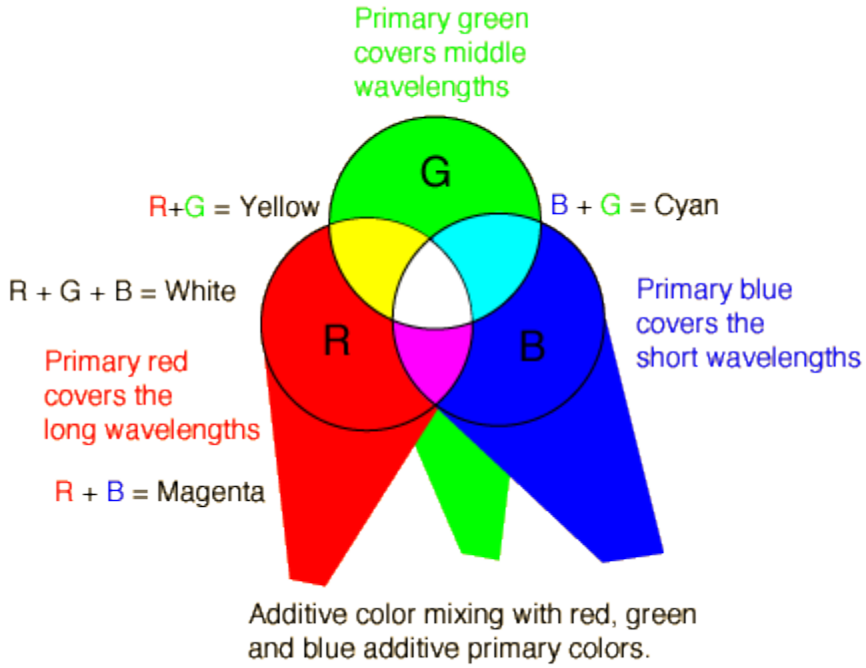
	Biasing establishing predetermined voltages or currents at various points of an electronic circuit for the purpose of establishing proper operating conditions in electronic components. Many electronic devices such as diodes, transistors and vacuum tubes, whose function is processing time-varying (AC) signals also require a steady (DC) current or voltage to operate correctly.		
15	Sound can be recorded and stored and played using either digital or analog techniques. • The bandwidth of the digital system is determined, according to the Nyquist frequency. The bandwidth of an analog system is dependent on the physical capabilities of the analog circuits. • In an analog system, other natural analog noise sources exist, such as flicker noise and imperfections in the recording medium. But digital recording has less noise.	**2**	**2**
16	Scrambler is a device that transposes or inverts signals or otherwise encodes a message at the sender's side to make the message unintelligible at a receiver not equipped with an appropriately set descrambling device. Scrambling is widely used in satellite, radio relay communications and PSTN modems.		
17	The frequency response is used to describe the audible frequency range that a loudspeaker can reproduce. Audio frequencies are measured in Hertz (Hz) and the theoretical range of human hearing is generally regarded as being from **about 20 Hz** (the very lowest bass tones) through **20 kHz** (the very highest treble notes)	**2**	**2**

			
18	In TV blanking means 'going black' as part of the video signal, the blanking voltage is at the black level. Video voltage at the black level cuts off the beam currents in the picture tube to black out the light from screen. The purpose of providing the blanking pulses is to make invisible the retraces of the scanning process. The horizontal blanking pulse at the frequency of 15625Hz. Blanks out the retrace from right to left for each line. The vertical blanking pulses at 50 Hz blank out the retrace from bottom to top for each field.	**2**	**2**
19	I. Print Speed. A print speed of at least 10 color pages per minute and 20 black-and-white pages per minute is a minimum standard to look for as a print speed specification. II. Printer Quality. III. Duty Cycle. IV. Ink Replacement Costs. V. Scanner Resolution. VI. Scanner Element Type. VII. OCR Scanner Software.	**2**	**2**
20	When wire is moved within a magnetic field a current is generated in the wire. Using this induction principle, the dynamic microphone uses a wire coil, magnet, and a thin diaphragm to capture the audio signal. The diaphragm is attached to the coil. When wire is moved within a magnetic field a current is generated in the wire. Using this induction principle, the dynamic microphone	**3**	**3**

	uses a wire coil, magnet, and a thin diaphragm to capture the audio signal.  The diaphragm is attached to the coil. When the diaphragm vibrates in response to incoming sound waves, the coil moves backwards and forwards past the magnet. This creates an electrical current in the coil, which is channeled from the microphone along wires.		
21	**Block diagram of Telephone System:** The block diagram of an IR remote switch consists of two sections: a transmitter section and the other receiver section. The transmitter section work as a normal remote and the receiver section remains in a stable position, which means, it is connected to any load. The main function of this remote control switch is to control any load like TV, Fan, Radio, light, etc.	**3**	**3**

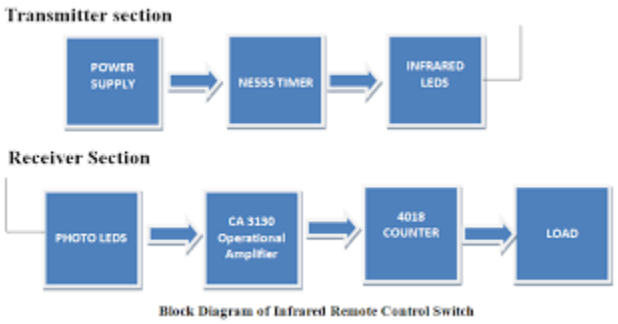
	Transmitter section  **Receiver Section**  In this circuit, there is only one switch to operate the transmitter. By using this switch, one can switch on or off the TV, radio, and home appliances. By adding an extra circuitry to the actual remote, the control circuit can even be used to control the volume of radio, TV and many more appliances.		
22	**Optical Recording** Optical storage systems consist of a drive unit and a storage medium in a rotating disk form. In general the disks are pre-formatted using grooves and lands (tracks) to enable the positioning of an optical pick-up and recording head to access the information on the disk. Under the influence of a focused laser beam emanating from the optical head, information is recorded on the media as a change in the material characteristics, often using a thermally induced effect. To record a bit, a small spot is generated on the media modulating the phase, intensity, polarization, or reflectivity of a readout optical beam which is subsequently detected by a detector in the optical head. Advantage of DVD over CD player 1. Capacity is more	**3**	**3**

	Disadvantage of DVD over CD- expensive		
23	**Color mixing** is the kind of **mixing** you get if you overlap spotlights in a dark room, as illustrated at left. The commonly used **additive** primary **colors** are red, green and blue, and if you overlap all three in effectively equal **mixture**, you get white light as shown  Additive color mixing: adding red to green yields yellow; adding all three primary colors together yields white. Additive color is in contrast to subtractive color, in which colors are created by subtracting (absorbing) parts of the spectrum of light present in ordinary white light, by means of colored pigments or dyes, such as those in paints, inks, and the three dye layers in typical color photographs on film.		



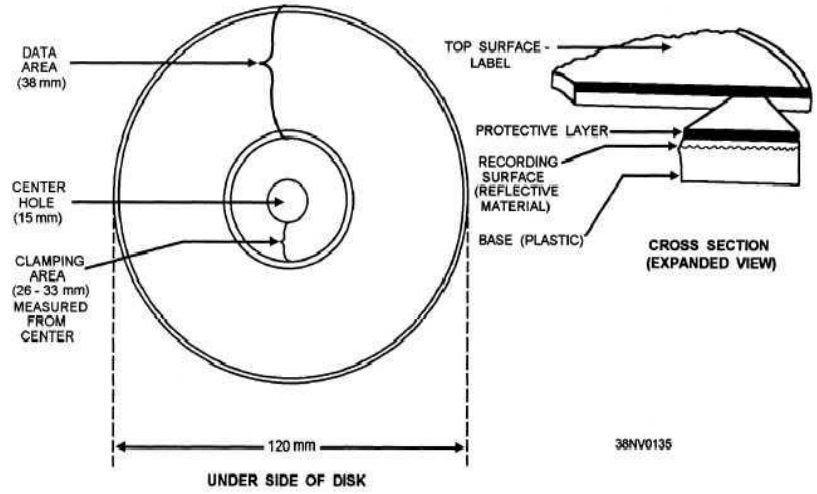
Additive color mixing with red, green and blue additive primary colors.

24



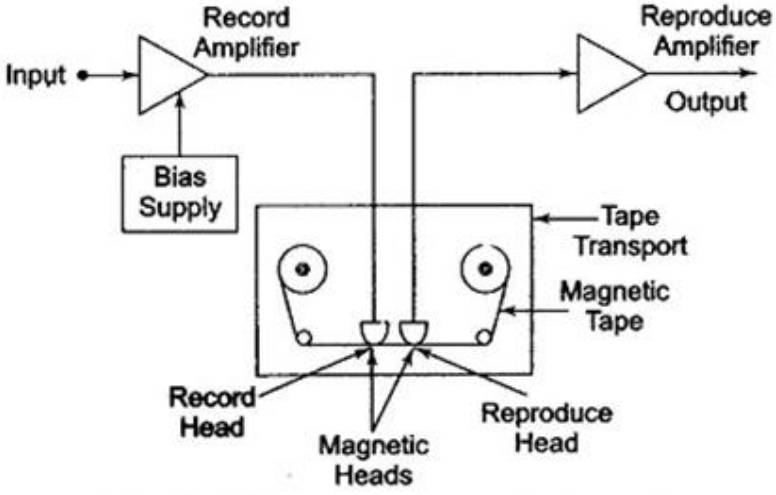
Block Diagram of Infrared Remote Control Switch

block diagram of an IR remote switch consists of two sections: a transmitter section and the other receiver section. The transmitter section work as a normal remote and the receiver section remains in a stable position, which means, it is connected to any load. The main function of this remote control switch is to control any load like TV, Fan, Radio, light, etc.

	In this circuit, there is only one switch to operate the transmitter. By using this switch, one can switch on or off the TV, radio, and home appliances. By adding an extra circuitry to the actual remote, the control circuit can even be used to control the volume of radio, TV and many more appliances.		
25	Physical Construction of Compact Disk  The base of a CD is a clear, hard plastic, known aspolycarbonite. The CD is molded from a master thatforms the pits and lands. The top of the plastic disc iscoated with a reflective material, such as aluminum, thatreflects the light of the reading laser. The entire disc iscoated with a protective lacquer and a label is printedon the top of the disc. Figure shows a typical compact disc, Thediameter of the disc is 120 mm. The center hole is 15mm in diameter. The area closest to the center hole isthe clamping area, and no data is written in this area.The clamping area is generally 26 mm to 33 mmwide,measured from the center of the disc.The data area is approximately 38 mm wide and isdivided into three sections. The table ofcontents for the entire disc occupies the first 4 mm ofthe data area. The next section is the program area, andoccupies 33 mm if the disc is filled to capacity. Thethird area of the disc is the lead-out area	**3**	**3**

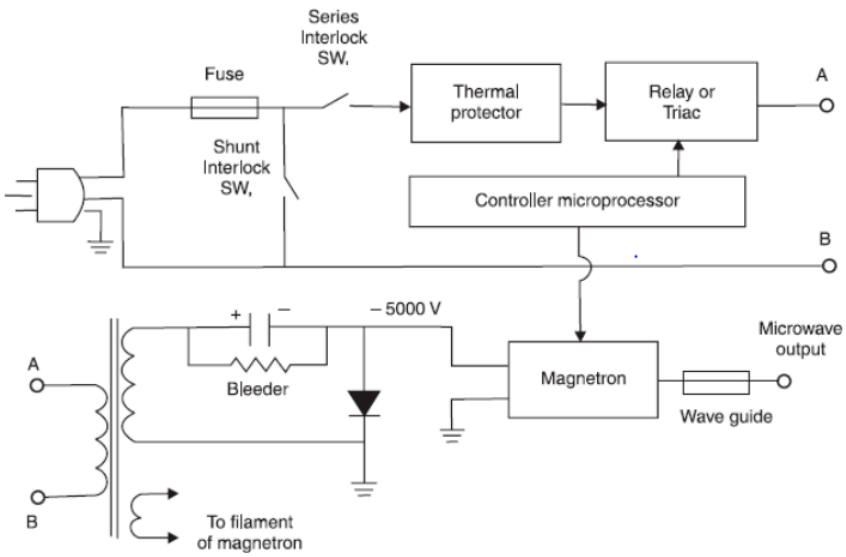
	and it is usedto tell the drive it has reached the end of the disc. Nodata is written on the outer edge of the disc; this allows for handling.		
26	1. Avoid loose wires, cables, and connections. 2. Assume any exposed metal is live with electricity unless otherwise verified. 3. Familiarize oneself with all ON/OFF buttons on equipment, circuit breakers, and disconnect switches of a bench. 4. Only make changes to the experimental setup when the circuit power is turned off and all power sources read zero voltage and zero current, as applicable. 5. Use wires of suitable length for their appropriate applications. Long wires or connections can cause clutter on a bench, and very short wires or connections can be too tight and may be easily disconnected. 6. Separate higher power equipment and connections from lower power equipment, such as microcontrollers, to avoid both interference and electrical interconnections between sensitive electronic devices and higher power devices. 7. Make sure that all DC power supplies, AC sources, and other power sources start from a zero voltage and zero current output or as directed in an experiment. Starting from a non-zero voltage is possible in certain applications where a voltage source should have a specific initial condition.	**3**	**3**
27	*1.* **TV has no image:** No image is a very common problem with cathode ray tube TVs. If you are facing such issue then check the obvious things first i.e. verify whether your TV is plugged in correctly and is receiving sufficient power for operation. If the power is OK, then check the video settings *2.* **Bowed picture or images not lined up:** This is a very common picture problem with CRT TVs. It is usually caused by the failure of an internal circuit called the convergence circuit. The circuit has convergence ICs, which when go bad create the problem of bowed	**5**	**5**

	picture. Sometimes bad or faulty soldered-in fuses and resistors can also cause image distortion. A technician or a PRO can easily repair this sort of problem in-home. *3.* **CRT displays one horizontal line in the center when turned-on :** Many time it happens that there appears a single thin horizontal line on the CRT TV screen. The probable cause of this problem can be a faulty yoke with a defective or burned coil inside it. The other probable cause can be loose contact between the yoke and the main board. The third possible cause can be a defective capacitor. ***4.Single vertical line in the center of screen:***Some time when you power on your CTR TV you see a single thin vertical line on the screen. The probable cause of this problem can be a faulty yoke with a defective or burned coil inside it. Other reason can be defective vertical ICs. The ICs may have lost contacts with solder joints because of the heat production during operation. *5.* **CRT TV crackles when powered up or emits a strong electrical odor:**This is not a very common problem. The most prominent reason is cathode ray tube failure. The minor crackling noise is due to high voltage arcing. The possible reason behind the burning smell is caused by insulation burn. In such situation, immediately unplug the TV from the power outlet. Call a professional TV repair person and get it corrected. **6. Colorful shadows on the sides:** *Whether you have a CRT TV or owned it before, you must have witnessed at some point of time, a colorful shadow on the sides of the screen* (can be seen as reddish orange shadow in the picture). *It is mainly due to presence of any magnetic device near the TV. Magnets placed near a CRT can damage the set's "shadow mask," which can cause the wrong colors to appear in that area.* ***7. Bad sound or no sound from the TV:*** No sound or less sound is a commonly heard problem with CRT TVs. The most possible reason is faulty speakers. Other reasons can be damaged audio amplifier, a low supply voltage to the amplifier or a faulty audio IC. There can be other reasons as well like some faulty internal wiring.		
28	Basic Components of a Tape Recorder A magnetic tape recorder consists of the following basic	**5**	**5**

	components. I. Recording Head II. Magnetic Head III. Reproducing Head IV. Tape transport mechanism V. Conditioning devices The Tape Recorder Working Principle is made of a thin sheet of tough, dimensionally stable plastic, one side of which is coated with a magnetic material. Some form of finely powdered iron oxide is usually cemented on the plastic tape with a suitable binder. As the tape is transferred from one reel, it passes across a magnetising head that impresses a residual magnetic pattern upon it in response to an amplified input signal.  Since the reproduce head generates a signal which is proportional to the rate of change of flux, the direct recording method cannot be used down to dc. The lower limit is around 100 Hz and the upper limit for direct recording, around 2 MHz. The upper frequency limit occurs when the induced variation in magnetisation varies over a distance smaller than the gap in the reproduce head. The signal on an exposed tape can be retrieved and played out at any time by pulling the tape across the magnetic head, in which a voltage is induced.		
29	**Microwave Oven**	**5**	**5**

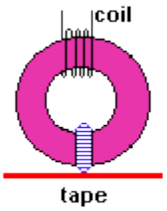
A microwave oven is used to cook (or heat) food with the help of microwaves produced by magnetron – the device producing microwaves in the oven. Microwave ovens are so quick and efficient because they channel heat energy directly to the molecules (tiny particles) inside food.
This induces polar molecules in the food to rotate and produce thermal energy in a process known as dielectric heating. Microwave ovens heat foods quickly and efficiently because excitation is fairly uniform in the outer25–38 mm (1–1.5 inches) of a homogenous (high water content) food item; food is more evenly heated throughout (except in heterogeneous, dense objects) than generally occurs in other cooking techniques.

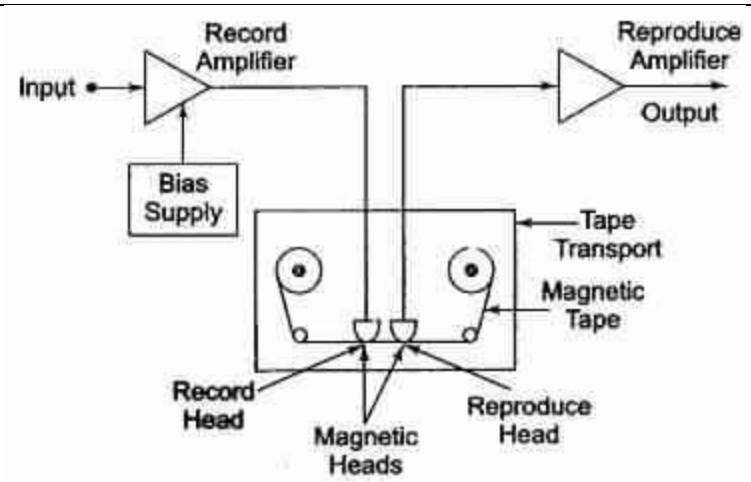
Block Diagram of Microwave Oven



A microwave oven heats food by passing microwave radiation through it. Microwaves are a form of non-ionizing electromagnetic radiation with a frequency higher than ordinary radio waves but lower than infrared light. Microwave ovens use frequencies in one of the ISM (industrial, scientific, medical) bands, which are reserved for this use, so they don't interfere with other vital radio services.
The mains plug and socket are three-pin earthing type. The fast blow ceramic fuse is of 15 A, 250 V. Interlock switchesare linked with the oven door. Power will be applied to the mains transformer only when the oven door is closed. At least one interlock switch is in series with the transformer primary, hence even a spot of dirt in the relay or trial, cannot turn the oven on when the door is open.
Consumer ovens usually use 2.45 GHz, a wavelength of 12.2 cm (4.80 in) while large industrial/commercial ovens often use 915 MHz 32.8 cm (12.9 in). Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric

	heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a partial positive charge at one end and a partial negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. Rotating molecules hit other molecules and put them into motion, thus dispersing energy. This energy, when dispersed as molecular vibration in solids and liquids. . Microwave ovens heat foods quickly and efficiently because excitation is fairly uniform in the outer25–38 mm (1–1.5 inches) of a homogenous (high water content) food item; food is more evenly heated throughout (except in heterogeneous, dense objects) than generally occurs in other cooking techniques.		
30	**Construction and principle of operation of Moving Coil Microphone** A moving coil microphone functions on the basic principle of Electromagnetic induction. It has a copper wire coil, which when moves in the magnetic field a voltage is generated. Then it is induced in the coil in proportion to its amplitude of vibration, which, in turn, depends on the sound pressure. A moving coil microphone contains a diaphragm, which is exposed to sound waves. The diaphragm carries a coil placed in the magnetic field. You will find there are many kinds of moving coil microphones. One of them is the Shure SM58, which is a classic microphone. This is an industry standard microphone designed mainly for live performances. They are strong and yet they do not require high power. They are used in some cases in studios for instrument recordings. Moving coil microphone is also the first choice for the snare drums, and also very popular on electric guitar amplifiers. Advantages of Moving coil microphone • Moving coil microphones are cheap and forceful • One of the biggest advantages of a moving coil microphone is the rugged construction of these microphones for rough use. • They are also ideal as they have high sound pressure level. It is a strong device and it is impossible to break one without intentionally doing so. • They are durable and can withstand pressure of any kind.	**5**	**5**

	Applications of Moving coil microphone This microphones are commonly used for various live performances		
31	Tape recording system: The tape head consists of a ring of soft magnetic material, called the core, with a small gap in it. A coil is wound around the core. The tape travels over the gap in the core.  During recording, an audio signal causes current to flow through the coil producing a magnetic field in the gap, as shown by the blue lines of force in the diagram. **Basic Components of a Tape Recorder** A magnetic tape recorder consists of the following basic components. 1. **Recording Head** 2. **Magnetic Head** 3. **Reproducing Head** 4. **Tape transport mechanism** 5. **Conditioning devices** **Magnetic Recording** The basic elements of a simple Magnetic Tape Recorder Working Principle system are illustrated in Fig	5	5



The Magnetic Tape Recorder Working Principle is made of a thin sheet of tough, dimensionally stable plastic, one side of which is coated with a magnetic material.

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