

# CBCS SCHEME

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BEC/BTE/BVL654B

## Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025 Consumer Electronics

Time: 3 hrs.

Max. Marks: 100

*Notes: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. M : Marks , L: Bloom's level , C: Course outcomes.*

		Module - 1	M	L	C
Q.1	a.	What is Microphone? Explain the desirable characteristics of a microphone.	10	L2	CO1
	b.	What is loudspeaker? Explain in detail the cone type loudspeaker.	10	L2	CO1
<b>OR</b>					
Q.2	a.	Explain moving coil type microphone. List out the importance features of moving coil type microphone.	10	L2	CO1
	b.	Explain high fidelity system. List out the ideal characteristics of ideal speaker.	10	L2	CO1
<b>Module - 2</b>					
Q.3	a.	Explain the details of compact disc.	10	L2	CO2
	b.	Explain playback process with necessary diagram.	10	L2	CO2
<b>OR</b>					
Q.4	a.	Explain D/A converter. What are the care to be taken while handling CD?	10	L2	CO2
	b.	Explain geometry of audio disc. Explain the main differences between CD and magnetic tape.	10	L2	CO2
<b>Module - 3</b>					
Q.5	a.	With the help of diagram demonstrate trichromatic coefficients and colour triangle.	10	L3	CO3
	b.	Explain recent advances in TV technology.	10	L2	CO3
<b>OR</b>					
Q.6	a.	With the help of example demonstrate chromaticity diagram.	10	L2	CO3
	b.	Explain mixing of colours with necessary diagram.	10	L2	CO3
<b>Module - 4</b>					
Q.7	a.	With a neat block diagram, explain the working of CCTV.	10	L2	CO4
	b.	With a neat block diagram, explain the working of electronic guessing game.	10	L2	CO4

MKS

OR

Q.8	a.	With a block diagram, explain the functioning of cable network.	10	L2	CO4
	b.	With a block diagram, explain the working of a calculator.	10	L2	CO4

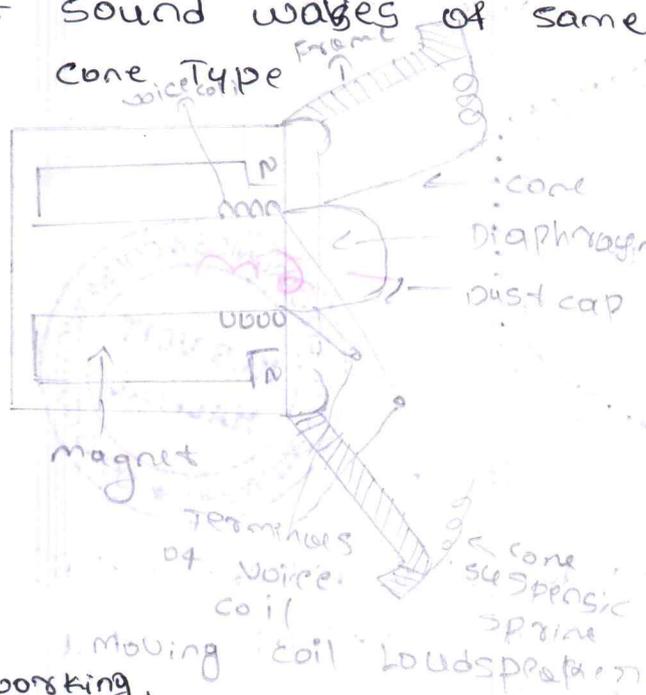
Module – 5

Q.9	a.	Explain the working of UPS and inverter.	10	L2	CO5
	b.	Explain the working of ignition system for automobiles.	10	L2	CO5

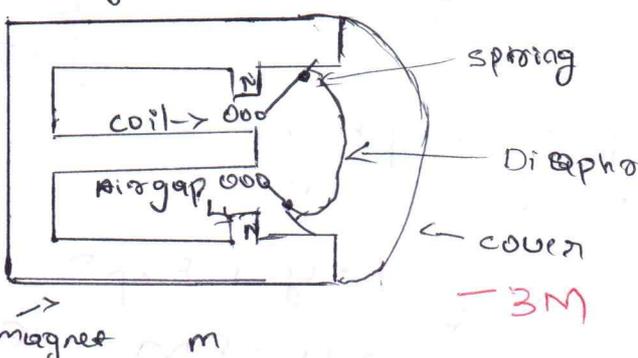
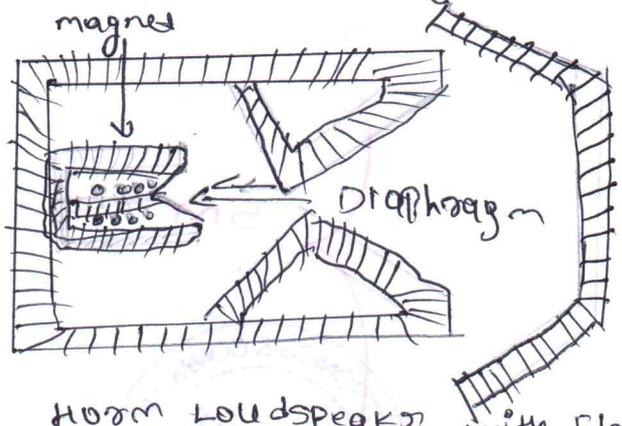
OR

Q.10	a.	Explain the working of microwave oven.	10	L2	CO5
	b.	With example explain recent advances in consumer electronics.	10	L2	CO5

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Q.No.	Solution and Scheme	Marks
Q1a)	<p>A microphone is a transducer which converts sound energy to electrical signal pulses</p> <p>Characteristics of Microphone Explanation of the followings</p> <ul style="list-style-type: none"> <li>i) Sensitivity</li> <li>ii) Frequency response</li> <li>iii) SNR</li> <li>iv) O/P Impedance</li> <li>v) Distortion</li> <li>vi) Directivity</li> </ul>	<p>10M</p> <p>-2M</p> <p>Any 4 Exp<sup>s</sup> 2x4 = 8M</p> <p>8M</p>
Q1b)	<p>converts electrical audio frequency signals into sound waves of same frequency.</p>  <p>working.</p> <p>when electric current flows through the voice coil, interaction between the field of permanent magnet and the magnetic field of current occurs. Due to this interaction a force acts on the voice causing its to and fro motion, since the conical diaphragm is vibrations in air. Thus the electrical signals are converted into sound waves of the same frequency.</p>	<p>10M</p> <p>5M</p> <p>5M</p>

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Q.No.	Solution and Scheme	Marks
Q2a)	<p>moving coil microphone</p>  <p>Labels: magnet, coil, air gap, spring, Diaphragm, cover</p> <p>Working — Explan  <math>e = Blv</math>  where <math>e = \text{emf.}</math></p> <p>Features:  1. Its sensitivity — 90 dB below IV  2. Its output impedance is — around 30 to 40 ohms.  3. Its frequency response — nearly flat in the 40 Hz to 8 kHz  4. It is an omnidirectional microphone  5. SNR = 25 dB  6. Its distortion is less than 5%</p>	10M -3M -5M -2M 5M
Q2b)	<p>Loudspeaker for High Fidelity systems.</p>  <p>Labels: magnet, Diaphragm</p> <p>Horn Loudspeaker with Flared Horn</p> <p>A special loudspeaker for high fidelity (hi-fi) music systems. It is a combination of a cone and exponential horn. The cone faces away from the audience. The enclosure for the cone and the exponential horn are so placed that the output from the horn is directed towards the audience.</p>	10M -4M



AK

Q.3a)

### Details of A compact Disc

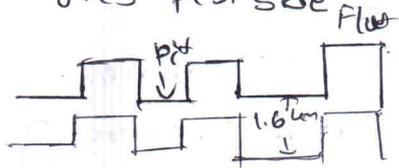
The recorded compact disc has the following dimensions and features  
 Thickness of Disc = 1.2 mm

10M  
3M

Diameter of disc = 12 cm      Playing time = 60 min  
 Rotation: Anticlockwise      Track pitch = 1.6  $\mu$ m  
 Velocity of scanning = 1.2 m/s      Quantisation = 16 bit  
 Speed = 500 rpm to 2000 rpm      Bit-rate = 43218 mbit/s  
 Storage capacity = 540 mega bytes per side  
 Error correction bit = 3548

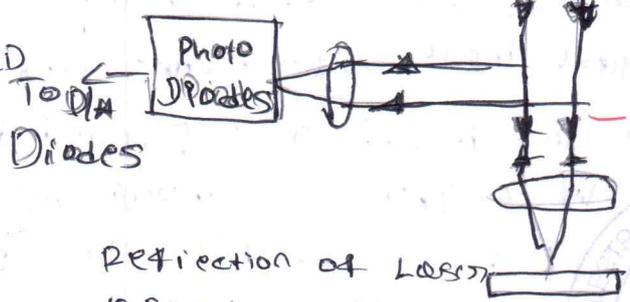
7M

Q.3b)



- 2M

Pits and Tracks on CD  
 To DA Diodes



10M  
4M

Reflection of Laser Beam in a CD player, CD

For converting the information on the CD into digital form, the entire disc (or the required portion) has to be scanned by the laser beam. The optical pick up is mounted on pivoting arm which describes a radial arc across the disc so that the complete track can be scanned. On the disc surface the scanning is from centre towards circumference of the disc. Each frame of the disc has. The pivotal arm is moved across the disc by a line motor.

6M

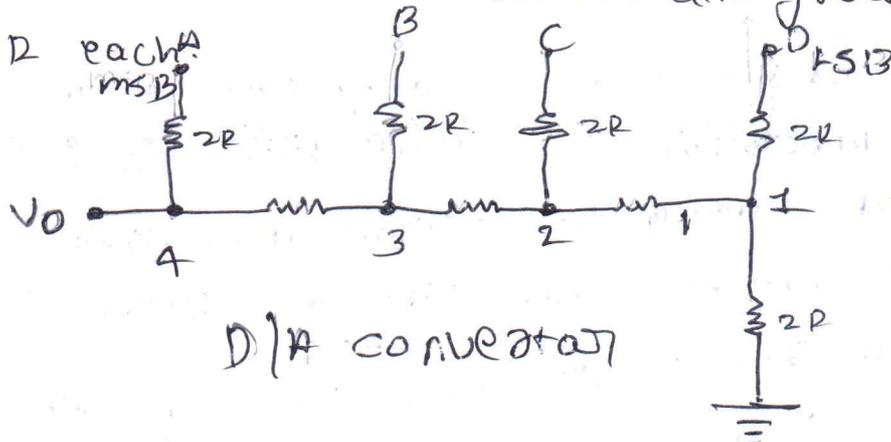
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Q 4a)

## D/A CONVERTER

resistance to ground is  $R + (2R)(2R) = 2R$ .

Thus from each of nodes 1, 2, 3, 4 the resistance of source and ground is  $2R$  each.



## D/A CONVERTER

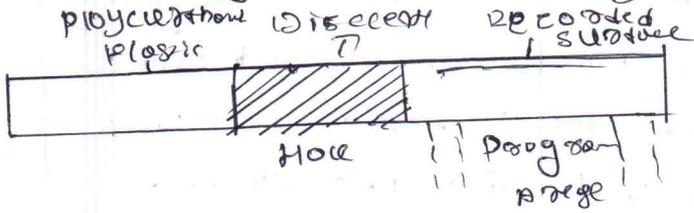
A digital input 0001 means that D is connected to a voltage  $V$  and all other inputs A, B, C are grounded. The output voltage  $V_0$  is  $V/16$ . A digital input 0010 means that C is connected to  $V$  and A, B, D are grounded giving an output of  $2V/16$ . Thus as input varies from 0000 to 1111, the output varies from  $V/16$  to  $V$  in steps of  $V/16$ .

## Handling of Compact Discs

1. Return the disc to case after use.
2. Do not write anything on disc surface.
3. Do not touch the playing surface. Handle by edge.
4. Wipe off dust etc with soft cloth.
5. Wipe in straight motion from centre to edge.

Q4b)

Geometry of Audio Disc



Edge view of compact disc

The disc is read by a laser beam focussed on its signal surface from the underside. The pitted surface is covered with a layer of evaporated aluminium to increase its reflecting power. The laser beam passes through the polycarbonate plastic base and hits either a flat or a pit, this plastic has an index of refraction  $n = 1.5$  and the laser used has an IR output with  $\lambda = 0.78 \mu\text{m}$  in air. If  $n = 1.5$ ,  $\lambda = 0.52 \mu\text{m}$  and  $\frac{\lambda}{4} = 0.13 \mu\text{m}$ . If the pits were  $0.13 \mu\text{m}$  deep the light reflected from pit would be shifted by  $\lambda/2$  i.e.  $180^\circ$  as compared to light reflected from flat.

10m

3m

4m

Parameters

- ① Sound quality
- ② Storage and
- ③ Durability.
- ④ Cost

CD

wider dynamic  
Range  
more ~~data~~  
~~is~~  
Less

Tape

smaller dynamic range  
Less ~~data~~  
more

3m



Q.5a) Trichromatic coefficients, Colour Triangle.  
The three primary colours green, red and blue have to be added in the proportion 0.59, 0.3 and 0.11 respectively to give white colour.

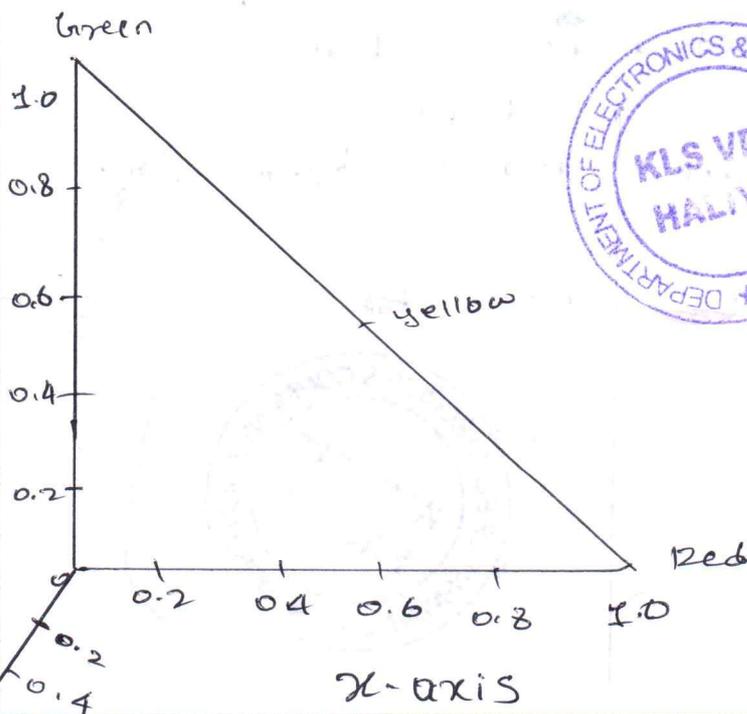
Thus  $T$  (trichromatic) units of white consist of  $\frac{1}{3}T$  unit of each green, red and blue. The trichromatic coefficients  $x, y, z$  can be represented in terms of tristimulus values  $x', y', z'$  as under.

$$x = \frac{x'}{x'+y'+z'} \quad y = \frac{y'}{x'+y'+z'} \quad z = \frac{z'}{x'+y'+z'}$$

If we add the above three equations

$$x+y+z = \frac{x'+y'+z'}{x'+y'+z'} = 1$$

Using these  $x, y, z$  coordinates we can easily find the three coordinates for secondary colours  
e.g. for magenta  $x=0.5, y=0$  and  $z=1-0.5=0.5$   
for yellow  $x=0.5, y=0.5$  and  $z=0$   
for cyan  $x=0, y=0.5$  and  $z=0.5$



Q.No.	Solution and Scheme	Marks
Q55)	<p>Recent Advances in TV Technology</p> <p><u>LCD TV</u></p> <p>LCD stands for liquid crystal display. LCD TV is called transmissive display. A high source behind the panel shines light through LCD display. A white diffusive panel behind LCD reflects and scatters solution the light</p> <p><u>LED TV</u></p> <p>LED TV uses light emitting diodes instead of cold cathode fluorescent lamp used in LCD TV). LED TV is extremely thin,</p> <ol style="list-style-type: none"> <li>2. LED TV uses 20-30% less power than LCD TV</li> <li>3. LED TV is more reliable than LCD TV</li> <li>4. LED TV is more expensive than LCD TV</li> </ol> <p><u>Plasma TV</u></p> <p>Plasma TV uses tiny cells containing electrically charged ionized gas similar to that existing in a fluorescent lamp, one Panel has millions of tiny cells arranged between two panels of glass. These cells hold mixture of noble gases and small amount of mercury.</p>	<p>10m</p> <p>3m</p> <p>3m</p> <p>6m</p>

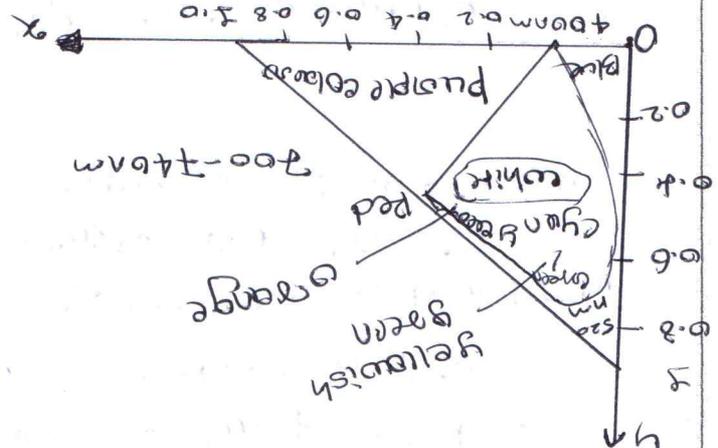


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B6b)

Chromaticity Diagram

Colour is specified by Hue, Luminance and saturation. These three specifications of colour can be represented graphically by chromaticity diagram. Hue and saturation are shown on x and y coordinates and Luminance is shown on z-coordinate. Thus this diagram is a three dimensional diagram. In x-y plane the diagram looks like a horse shoe shaped triangle.

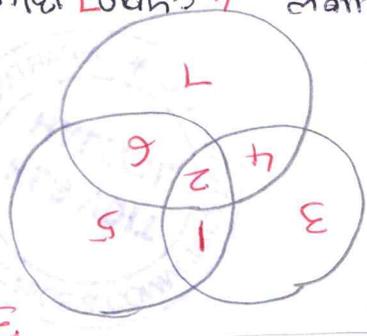


5m

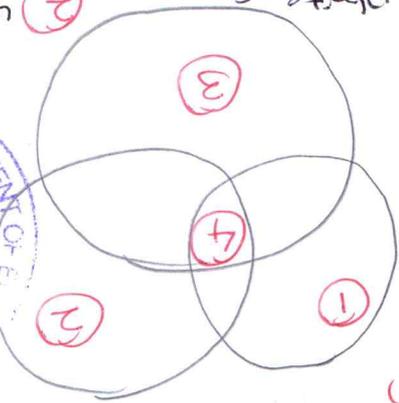
B6b)

Mixing of colours

When primary colours are added in give rise to another colour. When primary colours are added in give rise to another colour. Example = equal amount of RGB



3m



3m



- 1 Yellow
- 2 white
- 3 green
- 4 cyan/blue
- 5 red
- 6 magenta
- 1 white-green
- 2 white-red
- Blue = Red
- White = Green

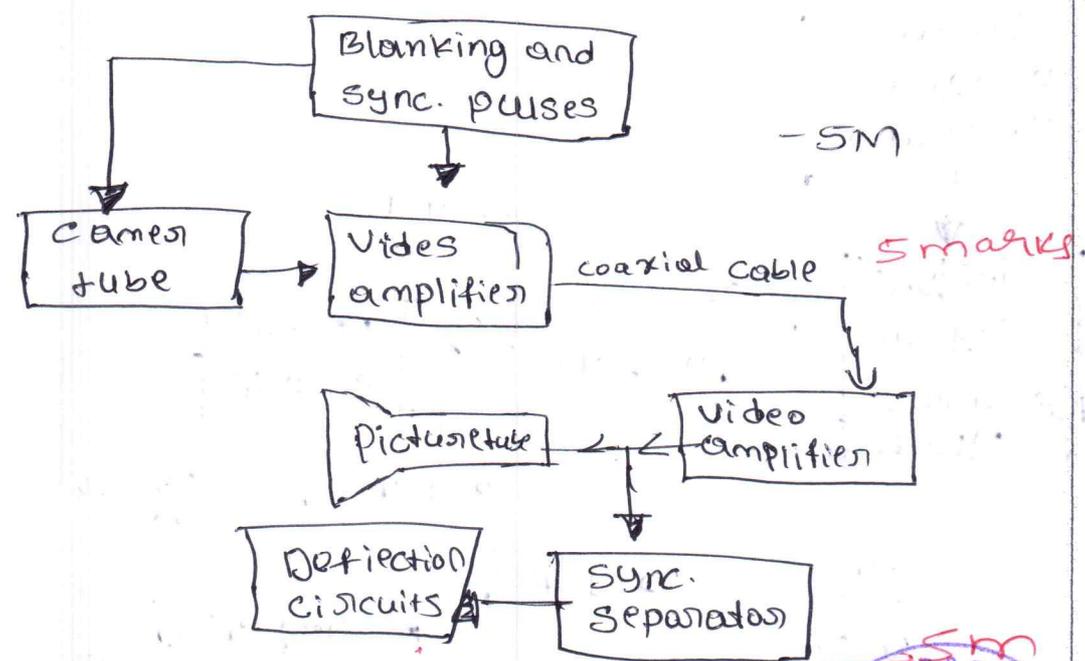
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5m

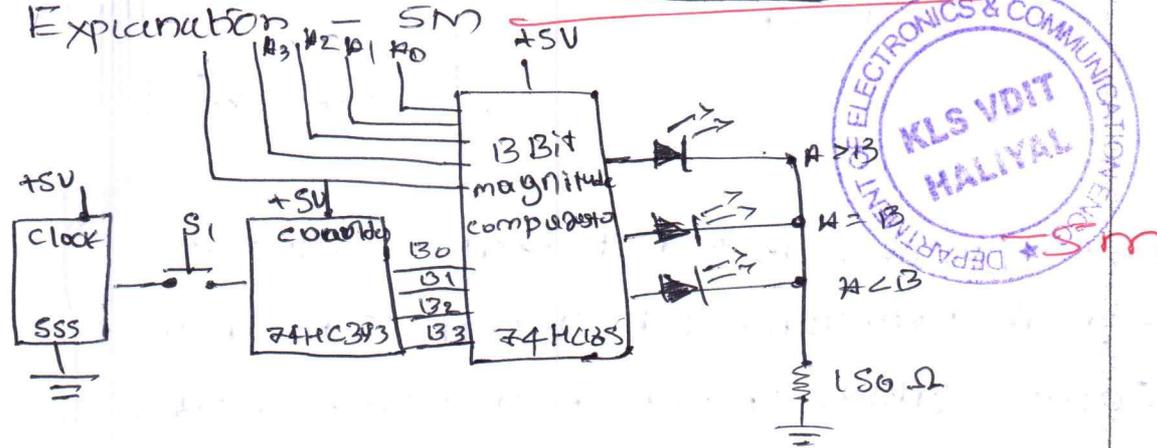
10

4m

Q7a) Block Diagram (CCTV) 10m



Q7b) Explanation 5m

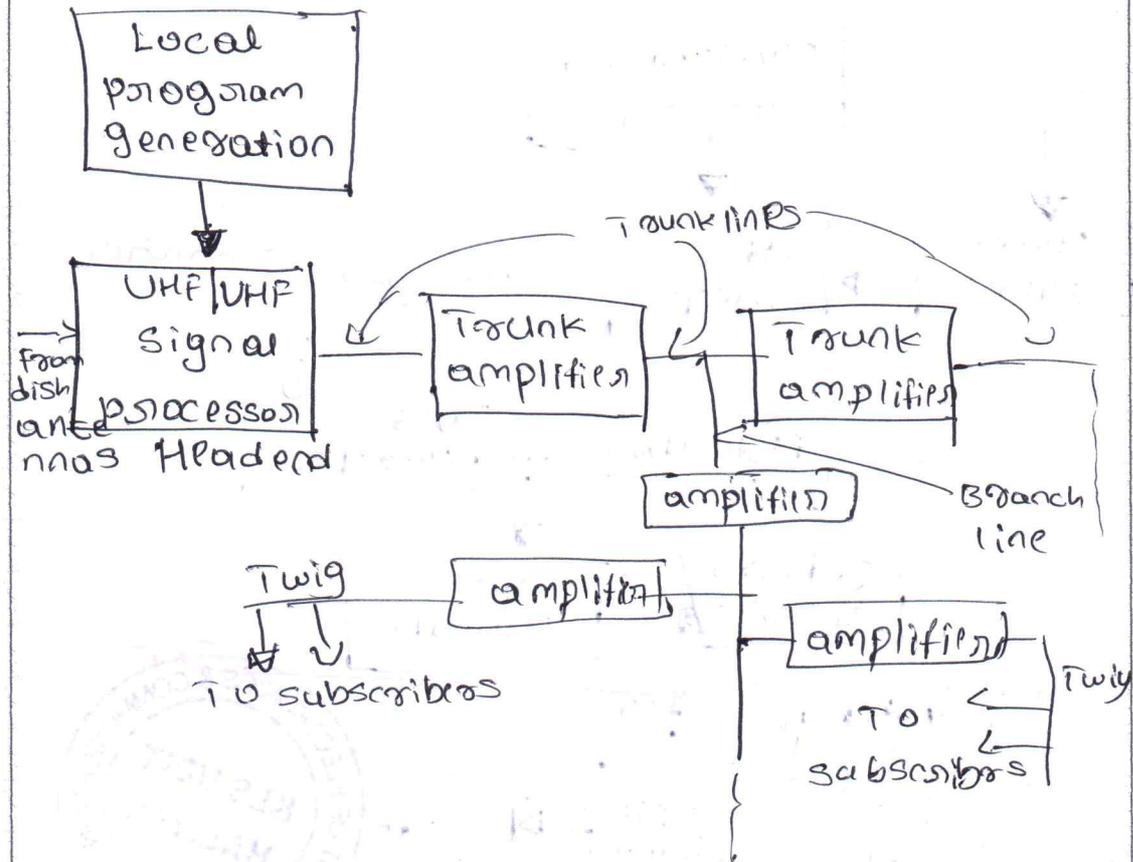


Initially the push button  $S_1$  is pressed thus connecting clock to the binary counter. A random number (between 0000 to 1111, i.e. decimal 0 to 15) is generated when the push button  $S_1$  is released. This random number is held by the counter at input  $B_0 - B_3$  of the magnitude comparator. The player's guess input is  $A_0 - A_3$ . The three outputs are  $A = B$  (green LED),  $A < B$  (yellow LED) and  $A > B$  (red LED) depending on the three

✱

Q.8a) Cable Network

5m



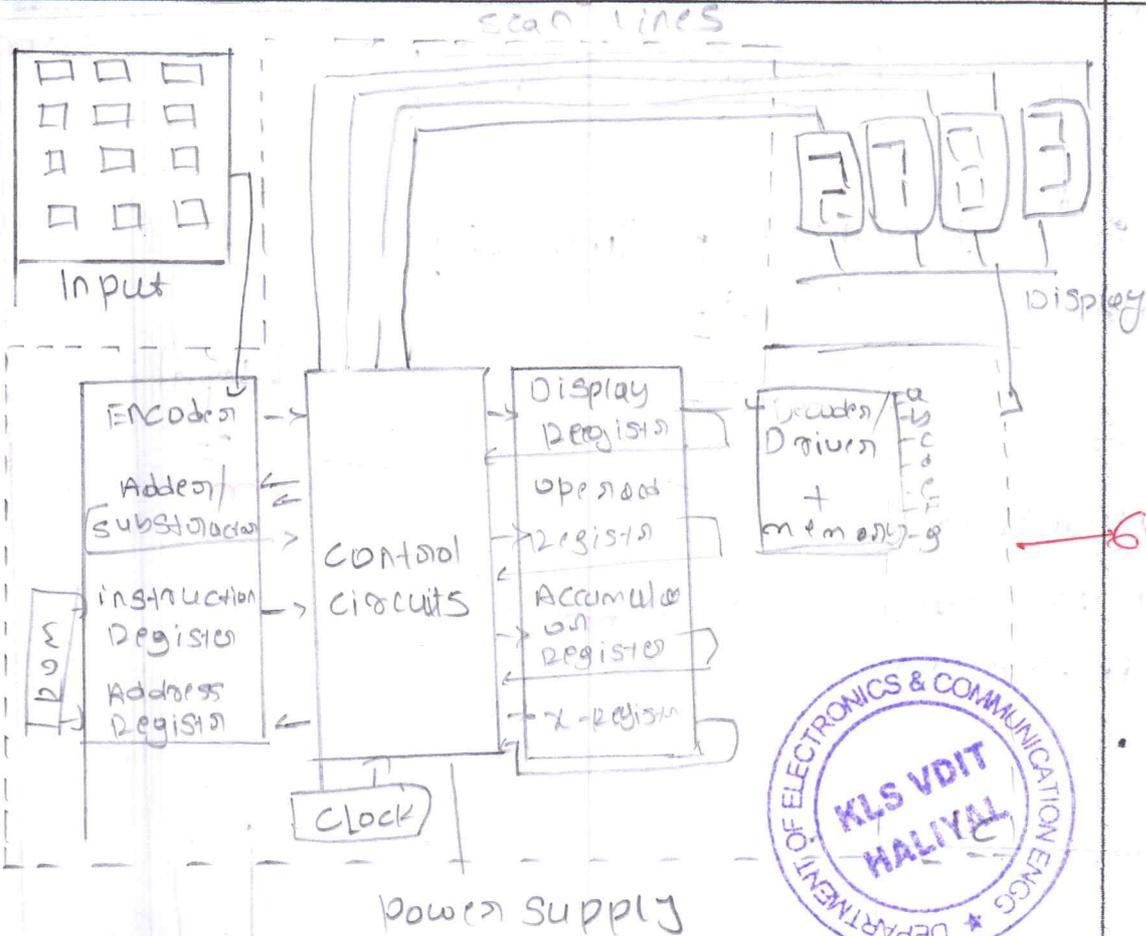
one typical cable distribution system. Signal attenuation of about 15dB in a 500m cable. Therefore a number of booster amplifiers (also known as repeaters) have to be installed to compensate the signal loss. An alternative system is a star system in which the UHF/VHF signal processor is at a central location and feeds a star network from which connections are given to subscribers.

5m



OK

98b)



6m

Clock. It sends constant frequency pulses to all the parts for synchronization of all operations.

Encoder. we work with decimal numbers. However all computers and calculators use binary numbers in their operations, Decoder/Driver. The arithmetic operations are performed in this section.

4m

Instruction Register, it controls the instructions necessary for bigger numbers with decimal points.

Display register. It stores the latest numerical etc. which we input into the calculator.

✍

RE

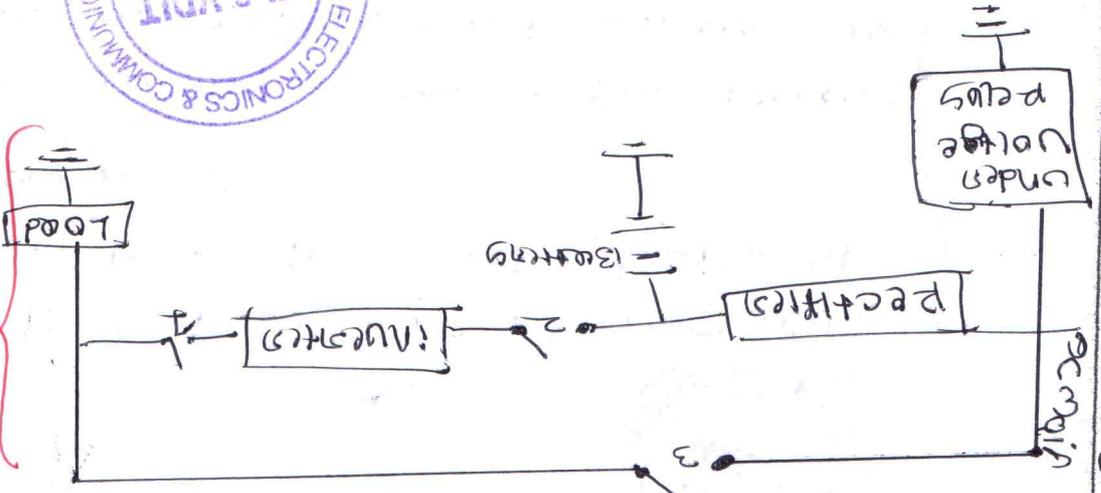
H: HV transformer, it converts 230V ac supply to high voltage  
 2. rectifier and filter; the rectifier converts ac to dc. Generally diode rectifier bridge is used. The filter is a high voltage capacitor which smoothen the wave shape. 3. Triac. The functions of triac is voltage control. A change in firing angle changes the output voltage

5m



3 Explain -

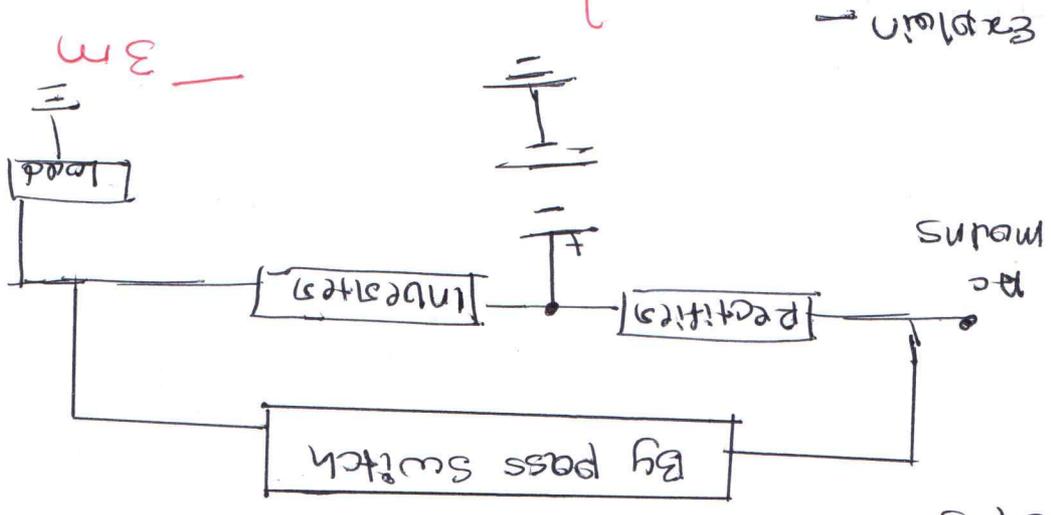
2m



3m

on line UPS -  
 off line UPS -

2m



3m

10m

Marks

Solution and Scheme

UPS

Q.No.

Q.No.	Solution and Scheme	Marks
Q.10a)	<p><i>continued</i></p> <p>A. motor The food items have to be stirred slowly to ensure even heating. A single phase low speed induction motor is used along with a stirrer.</p> <p>5 control circuits These include microcontroller, timer (to adjust cooking time), interlock switches (for safety). The interlock switch ensures that magnetron will be switched on only when door of oven is closed.</p>	5m
	<pre> graph TD     AC[AC 230 V, 50 Hz] --&gt; Transformer[Transformer HV]     AC --&gt; Motor((Motor))     AC --&gt; Interlock[Interlock Switch]     Transformer --&gt; Rectifier[Rectifier and filter]     Rectifier --&gt; Magnetron[cavity magnetron]     Magnetron --&gt; Waveguide[wave guide]     Waveguide --&gt; Chamber[cooking chamber]     Motor --&gt; Chamber     Chamber --&gt; Timer[Timer]     Chamber --&gt; Micro[micro]     Interlock --&gt; Chamber     </pre>	5m



OK

Q.No.	Solution and Scheme	Marks
Q.10b)	<p>Recent Advances in consumer electronics</p> <p><u>1. wireless connectivity</u></p> <p>The days of use of wire in consumer electronic devices are over. wi-fi standards have improved. High speed broadband connectivity is available through mobile phones. wireless charging of mobile phone batteries is likely to become a reality very soon.</p> <p><u>2. ultra low voltage CPU</u></p> <p>New models of cell phones, tablet computer notebooks have ultra low voltage CPU. The new microprocessor requires minimum charging but through mobile has still enough power capacity to handle the operating systems. The batteries have long life.</p> <p><u>3. DTV</u></p> <p>The new 3DTV has made a big impact on our life style. one can view 3D films at home. It is expected that in next five years all new TVs will be 3D.</p> <p><u>4. next generation chip</u></p> <p>All the advances in electronic equipment is due to improved chips. next generation chip called by bridge is likely to higher power efficiency, enhanced security and still smaller size.</p>	<p>10m</p> <p>3m</p> <p>3m</p> <p>1m</p> <p>3m</p>



OK