

## SCORING INDICATORS

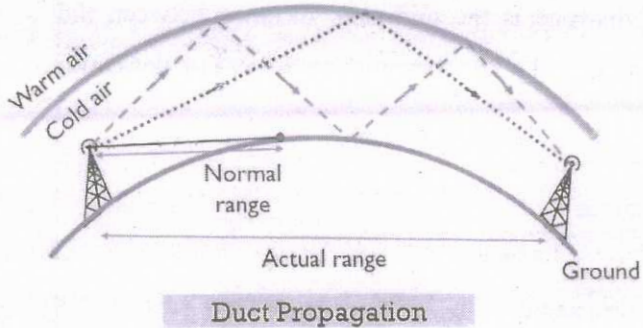
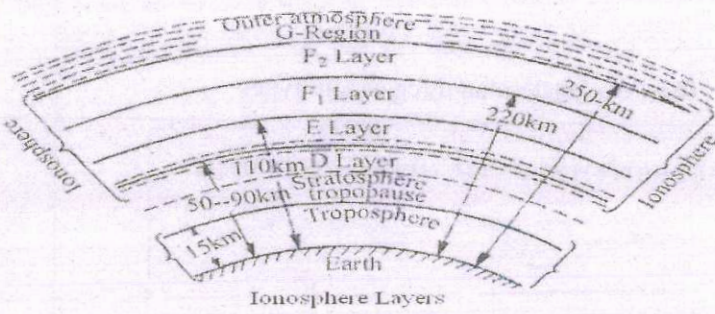
COURSE NAME : ANTENNA AND WAVE PROPAGATION

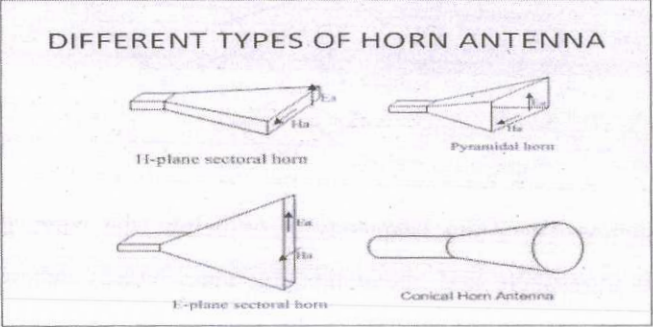
COURSE CODE : TED (21) – 6201A

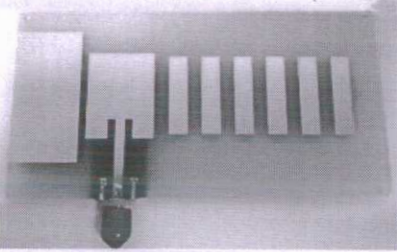
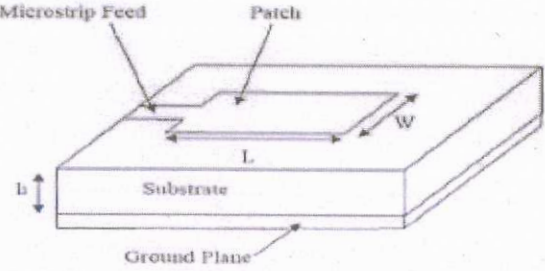
QID: 2102240180

Q No	Scoring Indicators	Split score	Sub Total	Total score
	<b>PART A</b>	1	1	<b>9</b>
I. 1	Ground wave	1	1	
I. 2	Direct waves	1	1	
I. 3	$9\sqrt{N_{max}}$	1	1	
I. 4	Height that is reached by a short pulse of energy which has the same time delay as the original wave.	1	1	
I. 5	D layer	1	1	
I. 6	Ratio of the maximum radiation intensity to average radiation intensity	1	1	
I. 7	73 ohms	1	1	
I. 8	Dipoles, Horn, Parabolic, Yagi-Uda etc..	1	1	
I. 9	Resonant antennas	1	1	
	<b>PART B</b>			<b>24</b>
II. 1	<ol style="list-style-type: none"> <li>1. Propagates by gliding over the surface of the earth</li> <li>2. Exists for vertical polarized antennas</li> <li>3. Suitable for VLF, LF, and MF</li> <li>4. Field strength varies with characteristics of earth</li> <li>5. Requires relatively high transmitting power</li> </ol> Etc.. any three	3	3	
II. 2	Distance that is covered by a direct space wave from the Tr. Antenna to Rr. Antenna Height of the transmitting antenna, Height of the receiving antenna, effective earth's radius factor	1 2	3	
II. 3	<ol style="list-style-type: none"> <li>1. Similar to wave guide propagation of microwaves</li> <li>2. Not a standard propagation</li> <li>3. Rare phenomenon</li> <li>4. Happens due to temperature inversion</li> <li>5. It is a specific case of refraction of RF energy</li> </ol>	3	3	
II. 4	Phase velocity – Rate at which the EM wave changes phase Group velocity – Velocity of propagation of the envelop	1.5 1.5	3	
II. 5	Critical frequency – Highest frequency that will be reflected to earth	1.5 1.5	3	

	Maximum usable frequency – Highest frequency of wave that is reflected by the layer at an angle of incidence other than normal.			
II. 6	Direction of electric field at a given point as a function of time Linear, elliptical and circular polarizations	1.5 1.5	3	
II. 7	1. It is used as a transducer 2. It is used as an impedance matching device 3. It is used to direct radiated energy in desired directions and suppress it in unwanted directions 4. Used to sense the presence of electromagnetic wave	Any three points	3	
II. 8	i) Reciprocity -the ratio of received power to transmitted power remains constant when the modes of antennas are interchanged from transmitting to receiving and vice versa. ii) Duality - an antenna is a circuit device with a resistance and temperature on the one hand and the space device on the other with radiation patterns, beam angle ,directivity gain and aperture.	1.5 1.5	3	
II.9	1. Length is other than the multiples of $\lambda$ 2. One end is excited and the other end is terminated 3. Wide bandwidth 4. Terminated by characteristics impedance 5. No standing waves 6. No reflected waves 7. It is a travelling wave antenna	Any three	3	
II.10	Diagram Single antenna but consists of two elements Used in Yagi-Uda antenna Radiation pattern same as that of straight dipole Impedance 292 ohm	Diagram Explanation 2	3	
<b>PART C</b>				<b>42</b>
III.	Explanation with diagram (diagram not compulsory) Features (three or four)	4 3	7	
IV.	A radio wave propagation technique that allows the transmission of UHF and VHF electromagnetic waves through the region near the tropospheric layer of the atmosphere is known as <b>duct propagation</b> . Basically in duct propagation, despite being reflected from the	4	7	

	<p>ionosphere or gliding over the surface of the earth, the waves propagate from an end to another by undergoing successive refraction from the troposphere.</p>  <p><b>Duct Propagation</b></p> <p>Features:</p> <ol style="list-style-type: none"> <li>1. Similar to wave guide propagation of microwaves</li> <li>2. Not a standard propagation</li> <li>3. Rare phenomenon</li> <li>4. Happens due to temperature inversion</li> </ol>			
V	<p>Effect of height of atmosphere on refractive index – modified refractive index - Explanation</p> <p>Duct propagation and its effects - Explanation</p>	4	7	
VI	<p><math>E = \frac{AE_0}{d}</math></p> <p><math>E =</math> Field strength at a point V/m</p> <p><math>E_0 =</math> F.S of a wave at a unit distance from the antenna</p> <p><math>A =</math> ground loss factor</p> <p><math>D =</math> distance of the point from transmitting antenna</p> <p>Explanation on these factors</p>	4	7	
VII	<p>Explan on F1, F2, E and D layer (diagram not necessary)</p> 	7	7	
VIII	<p>Critical Frequency: The radio frequency at or below, the wave gets reflected from ionosphere and above this frequency waves penetrate through ionospheric layer. This is frequency is known as critical frequency. <math>f_{cr} = 9\sqrt{N_{max}}</math></p>	2	7	

	<p>MUF : The highest frequency which can be reflected depends on angle of incidence and on distance between transmitter and receiver antennas.</p> <p><math>MUF = f_{cr}/\cos \theta</math></p> <p>Skip distance : Skip distance is the minimum distance between the earth's surface and the radio signal's transmission point. For flat earth, skip distance is given as:</p> $D_{SKIP} = 2h\sqrt{\left(\frac{f_{MUF}}{f_c}\right)^2 - 1}$ <p>Where, <math>D_{SKIP}</math>: skip distance  h: height at which reflection happens  <math>f_{MUF}</math>: maximum usable frequency  <math>f_c</math>: critical frequency</p>	2		
		3		
IX	<p>Efficiency : Ratio of radiated power to input power</p> <p>Band width : Range of frequencies over which .....</p> <p>Directivity : Ratio of maximum radiation intensity to average radiation intensity</p> <p>Gain <math>G = \text{Maximum radiation intensity from the subject antenna } (\Phi_s) / \text{Maximum radiation intensity from the isotropic antenna } (\Phi_i)</math></p> <p>The gain of an antenna <math>G = \text{Antenna efficiency} * \text{Antenna directivity } D</math></p>	1 2 2 2	7	
X	Explanation of radiation mechanism of a single wire or from a dipole	7	7	
XI	<p>Short dipole antenna</p> <p>Dipole antenna</p> <p>Half wave dipole</p> <p>Monopole</p> <p>Folded dipole</p> <p>Loop antenna    Brief explanation on three or four types</p>	7	7	
XII	<p style="text-align: center;"><b>DIFFERENT TYPES OF HORN ANTENNA</b></p>  <p style="text-align: center;">Diagram</p>	4	7	

	<p><b>Application of horn antenna</b></p> <ol style="list-style-type: none"> <li>1. Horns are used at microwave frequencies where moderate gains are sufficient.</li> <li>2. They are used as feed elements.</li> <li>3. They are often used in laboratories for the measurement of different antenna parameters.</li> </ol>	3	
XIII	  <p><b>Explanation</b></p> <p>Microstrip patch antennas are compact, low-profile antennas widely used in wireless communication systems due to their ease of integration into devices. Their construction involves key components such as the radiating patch, dielectric substrate, ground plane, and feeding mechanism.</p>	3  4	7
XIV	<p>A Uniform Linear Array (ULA) is a collection of sensor elements equally spaced along a straight line. The most common type of sensor is a dipole antenna that can transmit and receive Electromagnetic Waves over the air. Other types of sensors include acoustic sensors that may be used in air or under water.</p> <p>Features like</p> <p>can achieve higher gain (directivity) that is a narrower beam of radio waves, than could be achieved by a single element. In general, the larger the number of individual antenna elements used, the higher the gain and the narrower the beam. Etc..</p>	3  4	7