


Name:			
Enrolment No:			
<b>UNIVERSITY OF PETROLEUM AND ENERGY STUDIES</b> <b>End Semester Examination, December 2022</b>			
<b>Course: B. Tech.</b> <b>Program: Electronics and Communication Engineering</b> <b>Course Code: ECEG-3041</b> <b>Instructions: Attempt All Questions.</b>		<b>Semester: V</b> <b>Time : 03 hrs.</b> <b>Max. Marks: 100</b>	
<b>SECTION A</b> <b>(5Qx4M=20Marks)</b>			
S. No.		Marks	CO
Q 1	Describe V-antenna. State its advantages.	4	CO1
Q 2	Define the input impedance and radiation efficiency of an antenna.	4	CO1
Q 3	In a communication link, the distance between transmitter and receiver is 500 km. The communication is established via sky wave propagation and the height of ionospheric layer is 300 km above the earth's surface. If the critical frequency is 10 MHz, find the maximum transmission frequency beyond which the signal strength become negligible at receiver. Neglect earth curvature.	4	CO2
Q 4	Explain radiation pattern measurement setup with neat diagram.	4	CO2
Q 5	State Babinet principle.	4	CO1
<b>SECTION B</b> <b>(4Qx10M= 40 Marks)</b>			
Q 6	Explain the operation of the helix antenna in axial mode. Find the directivity of a 10-turn helix antenna having pitch angle $10^\circ$ , circumference C equal to $\lambda$ .	10	CO3
Q 7	What do you mean by frequency independent antennas? Explain in detail.	10	CO1
Q 8	Explain the various regions of earth's atmosphere and layers of ionosphere.	10	CO2
Q 9	Describe the small dipole antenna. Derive far-field components for a small loop antenna.  <b>or</b> Design a rhombic antenna using maximum electric field intensity design equations to operate at the frequency of 40 MHz with angle of elevation as $30^\circ$ with respect to ground.	10	CO2

**SECTION-C**  
**(2Qx20M=40 Marks)**

Q 10	(a) Derive the expression of the array factor of an N-element uniform spacing, uniform phase difference, and non-uniform amplitude linear array. (b) Differentiate between Binomial and Dolph-Chebyshev array. <b>or</b> Define directivity. Derive the directivity of the N-element uniform broadside antenna array. Find the directivity of the 10-element broadside isotropic antenna array with a uniform excitation and spacing of $\lambda/4$ .	<b>20</b>	<b>CO4</b>
Q 11	Describe microstrip patch antenna and explain its principle of operation based on cavity modal. Describe the feeding techniques of microstrip antenna.	<b>20</b>	<b>CO3</b>