Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Programme Name: B.Tech ASE+AVE **Semester : V**
Course Name : Electromagnetic waves and antenna **Time : 03 hrs**
Course Code : ECEG 3014 **Max. Marks : 100**
Nos. of page(s) : 02
Instructions:

1. **No students will be allowed to leave the examination hall before 1hr.**
2. **Assume any missing data with suitable explanation.**

SECTION A

S. No.		Marks	CO
Q 1	Discuss the term antenna aperture and radiation efficiency.	**4**	**CO4**
Q 2	Explain skin depth for the various metals. Draw the performance characteristic curve for the various metals.	**4**	**CO2**
Q 3	Differentiate between optimum working frequency and lowest usable frequency	**4**	**CO3**
Q 4	Define the term gain of the antenna; differentiate between power gain and voltage gain.	**4**	**CO4**
Q 5	Develop the relationship for Decibels and Nepers.	**4**	**CO1**
	SECTION B		
Q 6	The radiation resistance of a small dipole antenna is given as $80\ \pi^2\ (dl/lambda)^2$. The operating frequency is 20MHz and the length of the dipole is 3cm. Find out the value of radiation resistance, antenna gain and effective aperture if the efficiency factor is 0.6 and directivity is $1.5sin^2\theta$.	**10**	**CO4**
Q 7	If the power transmitted from the transmitter is 10kW and gains of transmitting and receiving antennas are 30dB and 30dB respectively then calculate the maximum power received at a distance of 10km over free space for 3GHz transmission frequency.	**10**	**CO2**
Q 8	Define the term polarization. Differentiate between HH, VV, VH and HV polarizations. How circular polarizations are used for the transmission signal measurements.	**10**	**CO1**
Q 9	For a high frequency radio communication link, the separation between two stations is 2500km on the earth's surface. If the height of the ionosphere is 200km and the critical frequency is 5MHs, calculate MUF for the link. ***OR*** The sky wave of frequency 20MHz is incident on E-layer at an angle of 30^0. Find	**10**	**CO3**

	out the angle of refraction is the electron density in E-layer is $5x10^5$electrons/cm^3.		
SECTION-C			
Q 10	Derive the refractive index of Ionosphere. Discuss the term plasma and plasma frequency and critical frequencies used in the Ionosphere wave propagation.	**20**	**CO3**
Q 11	Define the various types of wave propagating mediums; derive the wave equation parameters in free space and in conducting medium. ***OR*** Deduce the Maxwell's equations in time varying field and hence obtain the Helmholtz equation for the wave propagation in medium.	**20**	**CO1**