Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Electromagnetic waves and antennas **Semester: V**

Program: B Tech ASE **Time: 03 hrs.**

Course Code: ECEG3014P

Max. Marks: 100

Instructions: (a)Read all questions carefully before answering.
(b)Write your answers clearly and precisely.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Determine the loss tangent for each of the following nonmagnetic media at 10 MHz $(i)\varepsilon = 5\varepsilon_0, \sigma = 10^{-2} S/m$ $(ii)\varepsilon = 80\varepsilon_0, \sigma = 3S/m.$	**4**	**CO2**
Q 2	A standard air-filled rectangular waveguide with dimension a=8.636 cm, b=4.318cm is fed by a 4GHz carrier from a co axial cable. Determine whether a TE_{10} mode will be propagated. If so, calculate the group velocity and phase velocity.	**4**	**CO2**
Q 3	Find the electric flux density and volume charge density if electric field $E = x^3 a_x + 4y^4 a_y + 3z^2 a_z V/m$ in medium whose ε_r =2.	**4**	**CO3**
Q 4	Define antenna and describe the radiation mechanism of two wire antenna with suitable examples.	**4**	**CO1**
Q 5	Discuss the key insights provided by each Maxwell equations in integral and differential forms, and what are their physical interpretations?	**4**	**CO1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Derive and explain the equation of continuity for time varying fields.	**10**	**CO4**
Q 7	The plane wave in $E = 10\, Cos(wt - z) a_x V/m$ in air normally hits a lossless medium (ε =16ε_0, μ= μ_0) at z=0. Find Reflection and	**10**	**CO3**

	transmission coefficient. Also, Calculate the reflected electric and magnetic fields.		
Q 8	Describe the following: isotropic radiator, radiation pattern, Gain, Directivity and antenna efficiency.	**10**	**CO2**
Q 9	The refractive index of the ionosphere layer is 0.7 and MUF is 6MHz. if the height of the ionosphere layer is 300km above the earth's surface then find out the maximum electron density, critical frequency, and distance between transmitter and receiver for flat earth.	**10**	**CO3**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	(a) Derive the field expression for rectangular waveguide for transverse electric mode. Also derive the expression for the cut off frequency and cut off wavelength. (b) Explain construction and working of strip line.	**15+5**	**CO4**
Q 11	(a) Explain the working principle of parabolic reflector antenna with suitable diagram. (b) Calculate the FNBW and HPBW of parabolic reflector antenna which is operating at 10GHz and the diameter of its circular aperture is 5λ.	**10+10**	**CO2**