Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161003 Date:20/11/2018

Subject Name:Antenna & Wave Propagation

Time: 02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define Following Terms: 1.Beam Solid angle 2 Radiation pattern 3.Radiation density	**03**
	(b)	Define and explain radiation intensity with necessary equations.	**04**
	(c)	Explain radio Communication link between transmitting antenna and receiving antenna.	**07**
Q.2	**(a)**	Define antenna list the function of antenna.	**03**
	(b)	The radiation resistance of antenna is 80Ω and loss resistance is 10Ω calculate the antenna efficiency.	**04**
	(c)	Derive the expression of friss transmission formula.	**07**
		OR	
	(c)	Derive the expression for radiation resistance for half wave dipole.	**07**
Q.3	**(a)**	What is the effective area of half wave dipole operating at 500MHz?	**03**
	(b)	Explain normal mode of radiation of helical antenna.	**04**
	(c)	Explain broadside and end-fire array considering linear array of four isotropic sources.	**07**
		OR	
Q.3	**(a)**	Find the radiation resistance of a hertizian dipole of length λ/60.	**03**
	(b)	Define and explain axial ratio for helical antenna.	**04**
	(c)	Explain principal of pattern multiplication for array of point sources. Also give two examples of short dipoles.	**07**
Q.4	**(a)**	Explain reflector lens antenna.	**03**
	(b)	Explain FNBW and HPBW of a parabolic reflector.	**04**
	(c)	Explain frequency scanning arrays with necessary details.	**07**
		OR	
Q.4	**(a)**	Explain rumsey's principle.	**03**
	(b)	List the advantages and disadvantages of parabolic reflector.	**04**
	(c)	Explain smart antenna with necessary details.	**07**
Q.5	**(a)**	Explain the working of artificial lens antenna.	**03**
	(b)	List the feeding methods of microstrip patch antenna. Explain microstrip line feed in detail.	**04**
	(c)	Explain the following 1) Skip distance 2) Virtual height	**07**
		OR	
Q.5	**(a)**	Explain two antenna gain measurement method in detail.	**03**
	(b)	Explain ultra wide band antenna.	**04**
	(c)	Explain different modes of propagation with its practical significance.	**07**

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Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2161003 Date:01/05/2018

Subject Name:Antenna & Wave Propagation

Time:10:30 AM to 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define: (1) Beam area (2) Beam efficiency (3) Radiation intensity	**03**
	(b)	Define: (1) Directivity (2) Gain of the antenna (3) Effective length of antenna (4) Effective aperture	**04**
	(c)	Write a short note on types of antennas with necessary figures.	**07**
Q.2	**(a)**	Define: (1) Half Power Beam width (2) First Null Beam Width (3) Side Lobe Level	**03**
	(b)	Explain the polarization of wave and describe linear polarization.	**04**
	(c)	Derive and explain Friss transmission formula.	**07**
		OR	
	(c)	Write the advantages and disadvantages of : (1) Vertical polarization (2) Horizontal polarization	**07**
Q.3	**(a)**	With figure explain the working principle of Slot antenna.	**03**
	(b)	Explain the normal mode of radiation of helical antenna in detail.	**04**
	(c)	With necessary figure and derivations explain N element array of equal amplitude and spacing. Write the equation for array Factor.	**07**
		OR	
Q.3	**(a)**	Explain the working principle of small loop antenna.	**03**
	(b)	Write a short note on binomial array.	**04**
	(c)	Describe the properties of Endfire array.	**07**
Q.4	**(a)**	With figure explain the principle of Folded dipole	**03**
	(b)	Explain axial mode of radiation of helical antenna.	**04**
	(c)	With figure explain the concept of pattern multiplication.	**07**
		OR	
Q.4	**(a)**	Explain Cassegrain feed with figure.	**03**
	(b)	Explain the working principle of paraboloidal Reflector antenna.	**04**
	(c)	With figure explain the working principle of Three element Yagi-Uda antenna. Explain how improvement in basic Yagi-Uda antenna can be made. Also write the applications of Yagi-Uda antenna.	**07**
Q.5	**(a)**	Describe surface wave propagation briefly.	**03**
	(b)	Describe various types of basic horns with figure.	**04**
	(c)	With figure explain Babinet's principle.	**07**
		OR	
Q.5	**(a)**	Explain multihop propagation briefly.	**03**
	(b)	With figure describe the ionization layers.	**04**
	(c)	Explain the principle of operation of microstrip antenna. What are the advantages and limitations of microstrip antenna?	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019

Subject Code: 2161003 Date: 06/12/2019

Subject Name: Antenna & Wave Propagation

Time: 02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define the terms given below (i) Radiation Intensity (ii) Antenna Gain (iii) Antenna Resolution	**03**
	(b)	What is radiation resistance? Derive equation of radiation resistance in terms of antenna length and wavelength.	**04**
	(c)	Derive an equation of E and H field of an Electric dipole	**07**
Q.2	**(a)**	Define a concept of polarization for an antenna.	**03**
	(b)	Enlist different functions of antennas.	**04**
	(c)	Describe pattern multiplication in brief and explain Dolph-Tschebyscheff arrays in detail.	**07**
		OR	
	(c)	Describe various methods to feed antennas.	**07**
Q.3	**(a)**	Explain parabolic reflector antenna	**03**
	(b)	If electric field strength of plane wave is 2 V/m, what is the strength of a magnetic field H in free space?	**04**
	(c)	State and explain Babinet's principle and explain its application to any one antenna design.	**07**
		OR	
Q.3	**(a)**	Explain log periodic antenna	**03**
	(b)	Calculate the radiation resistance of current element whose overall length is $\lambda/50$.	**04**
	(c)	Briefly explain different modes of propagation of helical antenna and compare its performance in terms of geometry of that helix.	**07**
Q.4	**(a)**	Find the dimensions of a three elements Yagi-Uda antenna for 100 MHz operating frequency and 0.2λ inter element spacing.	**03**
	(b)	Explain multihop propagation with its one application.	**04**
	(c)	Explain about different types of radio wave propagation in detail	**07**
		OR	
Q.4	**(a)**	Estimate the diameter of a paraboloidal reflector required to produce a beamwidth of 15° and 1.5 GHz operating frequency.	**03**
	(b)	Explain about ultra wideband antenna.	**04**
	(c)	Elaborate the methods for Gain and Phase measurement.	**07**

Q.5	**(a)**	Write a short note on smart antenna	**03**
	(b)	Enlist advantages, disadvantages and application areas of microstrip antennas.	**04**
	(c)	Derive an equation of radiation resistance for small loop antenna structure	**07**

OR

Q.5	**(a)**	Explain about reflector lens antenna	**03**
	(b)	Describe about application of reciprocity theorem in antenna.	**04**
	(c)	Explain about antenna for terrestrial mobile communication systems.	**07**

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Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2161003 Date:14/05/2019

Subject Name:Antenna & Wave Propagation

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**

Figures to the right indicate full marks.

Q.1	**(a)**	Define terms with respect to Antenna systems: 1) Antenna 2) Beam efficiency 3) Radiation intensity 4) Directivity 5) Gain of the antenna 6) Effective length of antenna 7) Effective aperture.	**07**
	(b)	Define terms Polarization and modes of propagating waves. With appropriate figures describe different polarizations of an EM wave while its propagation.	**07**
Q.2	**(a)**	List out various types of Antenna systems.	**03**
	(b)	"Radiation resistance of a quadrature wavelength monopole antenna is 36.5 Ω". Justify your answer with necessary calculations for it.	**04**
	(c)	Explain in detail about Hertzian Dipole antenna systems. Also calculate radiation resistance value of a Hertzian dipole antenna of having length λ/40, λ/60 and λ/80 respectively.	**07**
		OR	
	(c)	Obtain the ratio of E_θ and H_Φ field components of a current element at a distance point in free space with necessary derivations using Maxwell's equation.	**07**
Q.3	**(a)**	Enlist different atmospheric layers with their approximate height, to be considered while wave propagation.	**03**
	(b)	Describe the principle of pattern multiplication in the working of Array antennas.	**04**
	(c)	State Babinet's principle and discuss its usability in the slot antennas and complementary antennas. "Log periodic antenna offers wide band width operations." Justify your answer.	**07**
		OR	
Q.3	**(a)**	Draw field pattern of an array of 4 isotropic point sources. separated by half wave length distance.	**03**
	(b)	Enlist and discuss about various antenna field radiation zones briefly.	**04**
	(c)	Prove that during wave propagation phenomenon MUF=fc/Cos(Θ). Also derive equations of gain of parabolic disc antenna.	**07**
Q.4	**(a)**	Explain about log periodic antenna with necessary figures.	**03**
	(b)	Enlist different feeding methods for antenna systems and describe any one of them in detail.	**04**
	(c)	List out all antenna Gain measurement methods and describe any two of them in detail.	**07**
		OR	
Q.4	**(a)**	Explain about loop antenna with necessary details.	**03**
	(b)	Describe lens antenna in detail.	**04**

	(c)	Describe phase measurement method used in antenna system in detail.	**07**
Q.5	**(a)**	Describe Ultra-Wide Band (UWB) antenna in brief.	**03**
	(b)	Draw five elements Yagi-Uda antenna system. Suggest ways to improve working performance of basic Yagi-Uda antenna.	**04**
	(c)	Explain terms with reference to Wave propagation phenomenon: (i) Duct propagation (ii) Virtual height (iii) MUF (iv) Skip distance	**07**

OR

Q.5	**(a)**	Describe Smart antennas briefly.	**03**
	(b)	Differentiate End fire and Broadside array antennas.	**04**
	(c)	Describe Micro strip antenna in detail. Also enlist advantages and dis advantages related to them.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2020

Subject Code:2161003 Date:22/01/2021

Subject Name:Antenna & Wave Propagation

Time:02:00 PM TO 04:00 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	What are the functions of antenna?	**03**
	(b)	Define: (1) Directivity (2) Resolution (3) Beam Area (4) Radiation Pattern	**04**
	(c)	Write a short note on types of antennas with necessary figures.	**07**
Q.2	**(a)**	Find the radiation resistance of a hertizian dipole of length λ/10.	**03**
	(b)	Using reciprocity theorem to antenna show that effective lengths of transmitting and receiving antennas are the same.	**04**
	(c)	Explain and derive Friss Transmission Formula	**07**
Q.3	**(a)**	Explain Principle of Pattern Multiplication.	**03**
	(b)	Explain Dolph-Tchebysheff distribution for linear arrays.	**04**
	(c)	Derive the far field components and the radiation resistance of a small circular loop with radius 'a' and with a uniform phase current.	**07**
Q.4	**(a)**	Explain Application of Babinet's Principle.	**03**
	(b)	Explain Yagi-Uda Antenna.	**04**
	(c)	Find out the length L ,width W and Half flare angles θ_E and θ_H of a pyramidal horn antenna for which the mouth height h=10λ.The horn is fed by a rectangular waveguide with TE_{10} mode. (Given : δ = 0.20λ in E plane, δ= 0.375λ in H plane)	**07**
Q.5	**(a)**	Explain Broadband antenna.	**03**
	(b)	Explain Cassegrain feed System with figure.	**04**
	(c)	Draw the Geometry of a helical antenna and explain its physical parameters.	**07**
Q.6	**(a)**	Explain log Periodic antenna.	**03**
	(b)	Explain different feeding techniques of Microstrip antenna with figure.	**04**
	(c)	With neat sketches briefly explain reflector lens antennas. Also write its applications.	**07**
Q.7	**(a)**	Calculate the range of space wave propagation with heights of transmitting and receiving antennas equal to 100 meters each.	**03**
	(b)	Explain Plasma antenna.	**04**
	(c)	Explain gain and phase measurement methods.	**07**
Q.8	**(a)**	Explain UWB Antenna.	**03**

(b) With figure describe Ionosphere layers. **04**

(c) Explain Following: **07**

(i) Duct Propagation

(ii) OWF

(iii) Multi hop Propagation

(iv) Skip Distance

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI EXAMINATION – SUMMER 2020

Subject Code: 2161003 Date:27/10/2020

Subject Name: ANTENNA & WAVE PROPAGATION

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the polarization of waves and describe elliptical polarization.	**03**
	(b)	Discuss the antenna field zone.	**04**
	(c)	Define Antenna and enlist its functions. Compare it with transmission line.	**07**
Q.2	**(a)**	Determine the distance from short dipole operating at 1MHz at which radiation filed is 4 times the induction field.	**03**
	(b)	How does the Friis transmission theory help to determine loss between the two antennas located in free space? Explain with necessary formula and theory.	**04**
	(c)	Define the following terms.(draw necessary figures and write equations if any) i) Front-to-back ratio ii) Resolution iii) Antenna apertures-physical and effective apertures iv) Beam efficiency, stray factor v) Radiation resistance	**07**
		OR	
	(c)	Starting from retarded current, derive an expressions for electric and magnetic components of a short dipole antenna if the spherical system is defined in r, θ and ϕ.	**07**
Q.3	**(a)**	Estimate directivity of an antenna with $\theta_{HP}=2°$ and $\phi_{HP}=1°$.Find gain of this antenna if efficiency factor k=0.5.	**03**
	(b)	Explain the experimental setup for the measurement of Gain of antenna.	**04**
	(c)	Enlist various types of horn antennas. Describe their functioning. Explain corrugated horn antenna.	**07**
		OR	
Q.3	**(a)**	Explain the principle of Folded dipole antenna with clean and neat figure.	**03**
	(b)	Explain how log-periodic antenna is works as broadband antenna.	**04**
	(c)	Define Pattern Multiplication principle. Using it, explain radiation pattern of 4 isotropic elements fed in phase, spaced $\lambda/2$.	**07**
Q.4	**(a)**	Explain reflector- lens antenna.	**03**
	(b)	Explain practical design consideration for the helical antenna.	**04**
	(c)	Describe the working principle, design and applications of microstrip patch antenna. Explain the physical significance of fringing field.	**07**
		OR	
Q.4	**(a)**	Explain Cassegrain feed with necessary figure.	**03**
	(b)	Compare the far field equations of small loop with short dipole.	**04**

	(c)	What do you mean by non-resonance antenna? Explain the design of rhombic antenna and enlist its advantages and disadvantages.	**07**
Q.5	**(a)**	Explain multihop propagation briefly.	**03**
	(b)	Explain babinet's principal.	**04**
	(c)	Explain the Different modes of Radio wave propagation.	**07**
		OR	
Q.5	**(a)**	Explain the features of Yagi Uda antenna	**03**
	(b)	Define the following terms.(draw necessary figures) (i) Maximum usable frequency (ii) Skip distance	**04**
	(c)	Explain the different layers of atmosphere.	**07**

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