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Course Name	**Antennas and Wave Propagation (AWP)**
Course Code	A50418
Class	**III - B. Tech I-Sem**
Branch	ECE
Year	2017 – 2018
Course Faculty	**I ADUM BABU**

SHORT ANSWER QUESTIONS

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I **ANTENNA BASICS**		
1	Define radiation pattern of an antenna?	Remembering	a
2	Define Radiation intensity?	Understanding	f
3	What are the differences between directive gain and power gain of antenna?	Remembering	f
4	Define Beam width and directivity of antenna?	Understanding	f
5	What are the different types of antenna apertures?	Remembering	f
6	What is meant by effective height of an antenna?	Understanding	f
7	Define beam area?	Understanding	g
8	Define power gain of antenna?	Understanding	g
9	Define directive gain of antenna?	Understanding	e
10	What is meant by directivity of antenna?	Understanding	e
11	What are the different lobes of principle radiation pattern of antenna?	Understanding	h
12	Define beam efficiency?	Understanding	f
13	Define antenna efficiency?	Analysis	f
14	What is meant by isotropic radiator?	Understanding	g
15	What is meant by reciprocity Theorem?	Understanding	g
16	Define scattering aperture of an antenna?	Understanding	e
17	Define physical aperture of an antenna?	Application	e
18	Define effective aperture of antenna?	Understanding	e
19	Draw radiation pattern of small dipole antenna?	Understanding	h
20	Define half power beam width and first null beam width?	Remembering	C
21	Define beam solid angle of an antenna?	Understanding	e
22	Draw radiation pattern of dipole antenna?	Understanding	h
23	What is the relation ship between beam area and directivity?	Remembering	C
24	Draw principle radiation pattern of antenna?	Understanding	h
25	What is the relation ship between half power beam width and first null beam width?	Remembering	C
	UNIT-II **VHF,UHF MICROWAVE ANTENNAS-1**		
1	Define parasitic element	Remembering	f
2.	What are the Advantages of folded dipole?	Analysis	f
3	How impedance can be increased by folded dipole	Understanding	f
44	What is Application of folded dipole?	Understanding	f
5	Compare half wave dipole & folded dipole?	Analysis	f
6	Define basic yagi uda antenna	Analysis	g
7	What are the characteristics of Yagi uda antenna?	Understanding	g
8	What is optimum spacing between parasitic elements of yagi uda antenna	Understanding	e

9	What is a normal mode of helix antenna?	Remembering	e
10	What is a axial mode of helix antenna?	Analysis	h
11	How gain is improved in normal mode of helical antenna	Understanding	f
12	What are disadvantages of normal mode of helical antenna	Remembering	f
13	List the applications of helical antenna?	Understanding	g
14	What are different transmission modes of helix	Remembering	g
15	How the axial mode is improved?	Understanding	e
16	What are the parameters to be considered for the design of a helical antenna?	Remembering	e
17	Define horn antenna	Understanding	e
18	What are different types of horn antennas	Understanding	h
19	What are the advantages horn antennas?	Understanding	a
20	How beam width and directivity is increased in horn antennas	Understanding	f
21	Define E-plane sectorial horn antenna.	Remembering	e
22	Define H-plane sectorial horn antenna	Understanding	e
23	Define pyramidal horn antenna	Understanding	h
24	Define conical horn antenna	Understanding	a
25	Write fermats principle	Understanding	f

UNIT-III

VHF, UHF AND MICROWAVE ANTENNAS - II

1	What are the features of micro strip antennas?	Understanding	f
2	What are the limitations of strip antennas?	Remembering	f
3	What are the different types of reflector antennas?	Remembering	f
4	What is mean by spill over?	Understanding	f
5	Define F/D ratio?	Understanding	f
6	What are the advantages of parabolic reflector antenna?	Understanding	g
7	What advantages of micro strip antennas?	Remembering	g
8	What are the drawbacks of parabolic reflector antenna?	Remembering	e
9	What are the characteristics of micro strip antennas?	Remembering	e
10	What are different feed methods of parabolic reflectors	Understanding	h f
11	What are different types of reflectors	Remembering	f
12	What are differences between corner reflector antenna flat reflector antennas	Understanding	g
13	What are different types of feeds used in parabolic reflectors	Remembering	g
14	Define zoning of lens antenna	Understanding	e
15	Define spill over and back lobe energy	Remembering	e
16	What are differences between metallic and non metallic lens antennas	Understanding	e
17	What are different types zoning in lens antenna	Understanding	h
18	What are different types of lens antennas	Understanding	a
19	List out different types of feeds used in the parabolic reflectors	Understanding	
20	Difference between corner reflector and parabolic reflector antennas	Understanding	e

21	What are the characteristics of microstrip antennas	Understanding	h
22	how dielectric substrate controls the bandwidth of micro strip antenna	Understanding	a
	UNIT-IV ANTENNA ARRAYS		
1	What are Hansen wood yard conditions	Remembering	F
2.	How directivity of end fire array is increased?	Analysis	F
3	Distinguish broad side and end fire arrays	Understanding	f
4	Draw the radiation pattern of end fire array	Understanding	f
5	Draw the radiation pattern of broad side array	Analysis	f
6	what are the differences between antenna gain measurement methods	Analysis	g
7	write friss transmission formulae and distance required for uniform fields	Understanding	g
8	List out different methods for measuring antenna gain	Understanding	e
9	Define radiation pattern of an antenna	Remembering	e
10	List out different methods using for measuring antenna impedance	Analysis	h
11	Define antenna array factor	Understanding	f
12	List out the expression of beam width for broad side array and end fire array	Remembering	f
13	What is the need for the Binomial array	Understanding	g
14	Differentiate broad side and End fire array?	Remembering	g
15	Define beam width of major lobe?	Understanding	e
16	What is Broad side array?	Remembering	e
17	Define End fire array?	Understanding	e
18	What is meant by antenna array?	Understanding	h
19	Define phase arrays	Understanding	a
20	Define scanning array	Understanding	f
	UNIT-V **WAVE PROPAGATION**		
1	What is meant by fading?	Understanding	f
2	What is the structure of atmosphere?	Remembering	f
3	What is the structure of ionosphere?	Remembering	g
4	Write the relationship between Skip distance ,MUF and critical frequency	Understanding	g
5	Write the relationship between MUF and critical frequency?	Understanding	e

6	what are the different modes of propagation	Understanding	e
7	what is the refractive index of ionosphere?	Remembering	h
8	Define virtual height?	Remembering	f
9	What are the types of fading?	Remembering	f
10	What is meant by Surface Wave?	Understanding	G
11	What is meant by Space Wave?	Understanding	g
12	What are inverse and multi path fading?	Understanding	e
13	What are different types of wave propagation	Understanding	e
14	List out different layers of ionosphere	Remembering	h
15	Define Optimum frequency?	Remembering	f
16	Define skip distance of ionospheric propagation?	Remembering	f
17	Define critical frequency of ionospheric propagation?	Remembering	e
18	Define MUF of ionospheric propagation?	Remembering	h
19	Define LUF of ionospheric propagation?	Remembering	f
20	What are the different layers of ionosphere	Remembering	f

LONG ANSWER QUESTIONS

S.NO	QUESTION	Blooms taxonomy	Course outcome
	UNIT-I **ANTENNA BASICS**		
1	Explain the retarded vector potential in detail?	Remembering	f

2	Derive an expression for the power radiated by the current element and calculate the radiation resistance ?	Understanding	f
3	Derive an expression for the far field component of a half wave dipole of an antenna	Remembering	f
4	Derive the total power radiated by half wave dipole?	Understanding	f
5	Show that the radiation resistance of a half wave dipole is 73Ohms?	Understanding	f
6	Derive an expression for the far field components of a short dipole antenna	Understanding	g
7	Derive the total power radiated by short dipole?	Understanding	g
8	Explain about quarter wave monopole antenna	Understanding	e
9	Explain about beam area and directivity of antenna and derive the relationship between them	Understanding	e
10	Explain about different antenna apertures	Understanding	h
11	Derive the relationship between effective aperture and directivity of antenna	Analysis	f
12	Explain about effective heights of transmitting and receiving antennas	Understanding	f
13	Calculate the maximum effective apertures for half wave dipole and short dipole antennas	Understanding	g
14	Prove that effective lengths of transmitting and receiving antennas are same	Understanding	g
15	Prove that antenna impedances of transmitting and receiving antennas are same	Application	e
16	Derive the expression for far field pattern of small loop antenna	Remembering	e
17	Prove that short magnetic dipole is equivalent to a small loop antenna	Understanding	e
18	Derive the expression for radiation resistance of general loop antenna	Understanding	h
19	Derive the expression for radiation resistance of small loop antenna	Remembering	a
20	Derive the expression for power radiated from general loop antenna	Understanding	f

21	Derive the expression for power radiated from small loop antenna	Understanding	a
22	Explain about different gains of antenna	Understanding	F
23	Derive an expression for directivity of small current element	Understanding	a
24	Find solid angle on a spherical surface between $\theta=20^0$, $\theta=40^0$ and $\phi=30^0$, $\phi=70^0$	Understanding	a
25	An antenna has a field pattern $E_\theta=COS^2\theta$ for $0<\theta<90^0$,find half beam width	Understanding	f
26	An antenna has a field pattern $E_\theta=COS\theta COS2\theta$ for $0<\theta<90^0$,find out first null beam width	Understanding	a
27	An antenna has Ri=10Ω power gain of 20 and directive gain is 22 Calculate Rr	Remembering	F
28	An antenna has Ri=10Ω and Rr=75Ω calculate antenna efficiency.	Understanding	a
29	The radiation resistance of antenna is 72ohm and loss resistance is 8 ohm. Calculate directivity if power gain is 16	Understanding	F
30	Calculate the gain of an antenna with circular aperture of diameter 3 m with a frequency of 5Ghz assume antenna is lossless	Understanding	a
	UNIT-II **VHF,UHF MICROWAVE ANTENNAS-1**		
1	With a suitable diagram, discuss the construction and operation of a Yagi uda antenna?	Understanding	f
2.	Explain in detail the working principle of Helical antenna in Normal mode	Understanding	g
3	Explain in detail the working principle of Helical antenna in Axial mode	Understanding	g
4	Explain the principle of operation and applications of folded dipoles?	Remembering	e
5.	Derive the expression for gain of an array of driven and parasitic element	Understanding	e
6.	Explain the transmission modes and applications of helical antenna	Remembering	e
7	Explain different types of horn antenna	Understanding	h
8.	Derive an expression for L and θ of horn antenna	Understanding	a
9	Explain advantages and disadvantages of helical antennas	Understanding	a

10.	Explain about geometrical features of helical antenna	Understanding	f
11	If the length of E plane sectorial is 15 cm design the horn dimensions such that it is optimum at 10ghz	Understanding	e
12	Design Basic Yagi Uda antenna at a frequency of 30MHz?	understanding	h
13	Design 5 element Yagi – Uda antenna at a frequency of 300MHz?	understanding	a
14	Calculate in db the directivity of 20 turn helix, having α = 12 °, circumference equal to one wave length?	understanding	a
15	Calculate the power gain of optimum horn antenna approximately with a square aperture of 10λ on one side?	understanding	f
	UNIT-III **ANTENNA BASICS**		
1.	Explain the impact of different parameters on characteristics of micro strip antennas?	Understanding	e
2.	Derive an expression for gain of corner reflector antenna	Understanding	e
3	Explain about plain sheet reflector antenna	Remembering	e
4	Explain the operation of paraboloidal reflector antenna	Understanding	h
5	Derive an expression for F/D ratio of parabolic reflector antenna	Remembering	a
6	What are the advantages and limitations of strip antennas?	Understanding	f
7	What are the feed methods of rectangular strip antennas?	Understanding	h
8	What are the features of micro strip antennas?	Understanding	a
9	Explain feed methods of parabolic reflector in detail?	Understanding	f
10	Explain advantages and disadvantages of corner and flat sheet reflectors?	Remembering	f
11	Explain feed methods of parabolic reflector in detail?	Remembering	f
12	what are different types of zoning ? explain in detail	Understanding	f
13	Derive expression for refractive index of non metallic dielectric lens antenna	Remembering	f
14	Derive expression for refractive index of E plane metal plate lens antenna	Understanding	f
15	Explain about non metallic dielectric lens antenna	Understanding	f
16	Derive the expression for electric field strength of corner reflector antenna	Understanding	g
17	Drive the expression for F/D ratio of parabolic reflector antenna	Understanding	g
18	Explain advantages and disadvantages of corner and flat sheet reflectors	Understanding	e
19	With reference to paraboloids, explain the following: i. Aperture Efficiency. ii. Front to Back Ratio.	Understanding	e

	iii. Types of Feeds		
20	A parabolic reflector of 1.8 m diameter is used at 6 GHZ calculate the beam width between first nulls and gain in db	Understanding	a
21	A parabolic reflector antenna with diameter 20 m, is designed to operate at frequency of 6GHz and illumination efficiency of 0.54. Calculate antenna gain?	Understanding	f
22	Calculate the angular aperture for a parabolic reflector antenna for which aperture number is (i) 0.25 (ii) 0.50 (iii) 0.60. Given the diameter of the reflector mouth is 10m; calculate the position of the focal point with reference the reflector mouth in each case?	Understanding	g
23	calculate the baem width between nulls of2.5m paraboloid reflected used at 6ghz what will be the gain	Understanding	g
24	Find out power gain in db of parabolidal reflector antenna whose open mouth aperture is10	Remembering	e
25	Estimate the diameter of a parabolic reflector required to produce a beam of 5^{o} width at 1.2GHz. How would you make this reflector?	Understanding	g
	UNIT-IV		
1	Draw the radiation pattern of broad side array of four isotropic sources separated by λ/2	Understanding	f
2	Explain about antenna gain measurement using direct comparison method	Understanding	g
3	Explain about antenna gain measurement using a) 2- antenna method b)3- antenna method	Understanding	g
4	Derive Friss transmission formulae	Application	e
5	Explain about antenna radiation pattern measurement	Remembering	e
6	Explain different antenna impedance measurements methods	Understanding	e
7	Derive the expression for distance requirement for uniform fields	Understanding	h
8	Derive the expression for total electric field of array of two isotropic sources of equal amplitude and opposite phase and draw the radiation pattern	Remembering	a
9	Derive the expression for total electric field of array of two isotropic sources of equal amplitude and equal phase and draw the radiation pattern	Understanding	f
10	Explain about a) binomial arrays b) phase arrays	Understanding	a
11	Derive the expression for directivity of end fire array	Understanding	F
12	Derive the expression for directivity of broad side array	Understanding	a
13	Draw the radiation pattern of eight isotropic sources separated by λ/2 using pattern multiplication principle	Understanding	f
14	Draw the radiation pattern of four isotropic sources separated by λ/2 using pattern multiplication principle	Understanding	g
15	Explain about a) broad side arrays b) end fire arrays	Understanding	g
16	Draw the radiation pattern of end fire array of four isotropic sources separated by λ/2	Remembering	e
17	Design broad side array of 8 isotropic sources of λ/2 space	Understanding	a

	between them. The pattern is to be optimum with side lobe level 26 db down to maximum lobe .		
18	Design a four element broad side array of λ/2 Space between elements .The pattern is to be optimum with side lobe level 19.1 db down to maximum lobe	Understanding	f
19	Calculate the directivity of a given linear end fire array of 10 isotropic sources with a separation of λ/2 between them.	Understanding	g
20	Calculate the directivity of a given linear broad side array of 10 isotropic sources with a separation of λ/2 between them.	Understanding	g
	UNIT-V		
1.	Describe the following: I.Space wave propagation. ii. Duct propagation.	Understanding	e
2.	Explain about different layers of ionosphere	Understanding	e
3	Explain the process of radio wave propagation via ionosphere	Remembering	e
4	Explain about a) Effect of the earth on radiation patterns b) atmospheric effects on radio waves	Understanding	h
5	Explain the terms ray path ,skip distance and maximum usable frequency as applied to ionosphere propagation	Remembering	a
6	Explain the effect of atmosphere on space wave propagation	Understanding	f
7	Explain how propagation takes place through ionosphere	Understanding	h
8	Derive the expression for MUF for curved earth in sky wave Propagation	Understanding	a
9	Derive the expression for MUF for flat earth in sky wave propagation	Understanding	f
10	Obtain the expression for field strength of a space signal	Remembering	F
11	Explain structure of ionosphere	Understanding	h
12	Describe about the Ground wave propagation	Remembering	a
13	Define to MUF and Critical frequency Derive the expressions for the same. What is Secant law?	Understanding	f
14	What is virtual height ?Derive the expression for the same	Understanding	h
15	Explain the terms sky wave ,ground wave and ionospheric Propagation	Understanding	a
16	A high frequency radio link has to be established between two points on earth 200Km away .The reflection region of ionosphere is at a height of 200Km and has a critical frequency of 6MHZ calculate the MUF for the given path	Remembering	f
17	Two points on earth are 1500 km apart and are to communicate by means of HF for single hop transmission the critical frequency at that time is 7MHZ and conditions are idealized calculate the MUF for these two points if the height of ionospheric layer is 300Km	Understanding	F
18	Calculate the critical frequencies for F1,F2,e layers for which maximum ion densities are $2.3x10^6$,$3.5x10^6$,and $1.7x10^6$ electrons per c.c respectively.	Remembering	h

19	A high frequency radio link has to be established between points at a distance of 2500 km on earths surface considering the ionospheric height to be 200Km and its critical frequency 5 mhz calculate the MUF for the given path.	Understanding	a
20	What is the critical frequency for reflection at vertical incidence if the maximum value of electron density is $1.24 \times 10^{6} cm^{-3}$	Understanding	f