SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics and Communication Engineering
B. Tech. (ECE) Minor II Examination (ODD) 2018-19

Entry No: 17BEC033

Date:

Total Number of Pages: [01]

Total Number of Questions: [01]

Course Title: Antenna & Wave Propagation

Course Code: ECL 2041

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume an appropriate data / information, wherever necessary / missing.

	Section - A		
Q1.	(a) The characteristic impedance of the free-space is _____. (b) Directivity of the isotropic radiator is _____.	[01] [01]	CO1 CO2
Q2.	What do you mean by the following terms? (a) Radiation Intensity (b) Directivity (c) Polarization	[03]	CO3
	Section - B		
Q3.	In a medium characterized by $\sigma = 0, \mu = \mu_0, \varepsilon = 4\varepsilon_0$ and $E = 20\sin(10^8 t - \beta z)\bar{a}_y$ V/m, calculate β and $\bar{H}$.	[03]	CO1
Q4.	For an infinitesimally small radiator of length *dl*, operating at wavelength λ_0 in the free space, Surface current density **Js,** find the expression for the electric and magnetic field intensities in the far-field region.	[04]	CO4
Q5.	A magnetic field strength of 5μA/m is required at a point $\theta=90^0$, 2km from an antenna in air. Neglecting ohmic loss, how much power the antenna must transmit if it is a Hertzian dipole of length λ/25?	[03]	CO2
Q6.	(a) For a small antenna of length dl=λ_0/20 where λ_0 is the free space wavelength, find the radiation resistance Rr. (b) If loss resistance R_l=2Ω, find the efficiency of the antenna.	[03] [02]	CO5

Course Outcomes

1. Able to understand the basic operation of E.M. wave based application.
2. To design and analyze various types of antenna.
3. Understand the different propagation modes of EM wave.
4. Able to find suitability of antennas for different applications.
5. To understand the different types of antennas and their applications

CO	Questions Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	1(a),3	04	62
CO2	1(b),5	04	62
CO3	2	03	62
CO4	4	04	62
CO5	6	05	62

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics and Communication Engineering
B. Tech. (ECE) Minor II Examination (EVEN) 2018-19

Entry No: 1 7 B E C 0 3 3

Date:

Total Number of Pages: [01]

Total Number of Questions: [01]

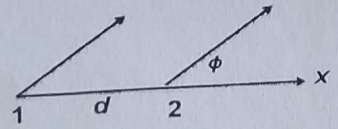
Course Title: Antenna & Wave Propagation

Course Code: ECL 2041

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume an appropriate data / information, wherever necessary / missing.

	Section - A		
Q1.	(a) The input impedance of a monopole antenna is _____ of dipole antenna. (b) The radiation pattern of a vertically installed half-wavelength dipole is_____.	[01] [01]	CO1 CO1
Q2.	(a) Using pattern multiplication technique, find the array factor of four isotropic radiators placed at distance of d=0.5 λ from each other. (b) If the radiators are replaced by the non-isotropic sources with radiation pattern of $E_o=E_1\sin\phi$ then draw the radiation pattern.	[03] [02]	CO3
	Section - B		
Q3.	A receiving antenna #1 picks up 50μV signal. The transmitting station switches to nearby antenna#2 which has a 5 dBi gain over the original antenna. Find the received voltage in the second case.	[02]	CO4
Q4.	Given a linear broadside uniform array of 10 isotropic elements (N=10) with a separation of 0.25 λ between elements, Find the directivity in dB for (a) broadside array (b) Ordinary End-Fire array (c) Hansen Woodyard End-Fire Array.	[03]	CO5
Q5.	Prove that the input impedance of a 0.5 λ long dipole is appx. 73 Ohm.	[04]	CO2
Q6.	Suppose two dipoles with excitations $E_1 = e^{j\beta d/2}$ and $E_2 = e^{-j\beta d/2}$ are placed as shown in the figure. Prove that the maxima of this array factor is given by $\phi m = \cos^{-1}\left(\frac{\pm 2m\pi + \beta d}{\beta d}\right), m = 0,1,2...$ Also show that the array factor has at least one maxima along $\phi = 0^0$. 	[03] [01]	CO2

Course Outcomes

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CO	Questions Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	1	02	62
CO2	5,6	08	62
CO3	2	05	62
CO4	3	02	62
CO5	4	03	62

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics and Communication Engineering
B. Tech. (ECE) Major Examination (Even) 2018-19

Entry No: 1 7 B E C 0 3 3
Date:

Total Number of Pages: [02]
Total Number of Questions: [08]

Course Title: Antenna & Wave Propagation
Course Code: ECL 2041

Time Allowed: 3.0 Hours **Max Marks: [50]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume an appropriate data / information, wherever necessary / missing.

	Section - A		
Q1.	(a) In fundamental mode, microstrip patch antenna radiates in _____direction.	[01]	CO1
	(b) Input impedance of a dipole antenna is 68Ω, the input impedance of the slot antenna of same size is _____ Ω.	[01]	CO1
	(c) The maximum allowable phase error in the E-plane of pyramidal horn is _____ degree.	[01]	CO1
	(d) The cut-off frequency of WR90 waveguide in the dominant mode is _____.	[01]	CO1
	(e) Directivity of a quarter wavelength monopole antenna is about _____dBi.	[01]	CO1
	(f) In the sky wave propagation, the maximum usable frequency (MUF) is_____ than the critical frequency.	[01]	CO3
Q2.	What do you mean by followings? Explain.		
	(a) Directivity	[02]	CO1
	(b) Antenna field zones	[02]	CO1
	(c) Radiation pattern	[02]	CO1
	(d) Optimum usable frequency	[02]	CO3
	Section - B		
Q3.	The effective aperture of the transmitting and receiving antennas operating at 6MHz are $8\lambda^2$ and 12 λ^2, respectively. The separation between these antennas is 1.5 km. If, an input power of 25 KW is transmitted then find the power received by the receiving antenna.	[03]	CO4
Q4.	(a) In context of antennas, write and prove the reciprocity theorem.	[03]	CO4
	(b) What is its' application?	[01]	
Q5.	Derive the expression of electric field strength (E_R) for the space wave propagation.	[06]	CO3
Q6.	(a) Design a Log-periodic dipole antenna in the frequency range of 10 MHz-30MHz for a directivity of 8.5 dBi. The value of τ and σ are 0.895 and 0.166, respectively.	[06]	CO2
	(b) What are the similarities and dissimilarities between Yagi-Uda and LPDA?	[02]	CO5
Q7.	(a) Prove that the peak of the array factor of an N-element uniform array is given by the solution of the following equation. $N\tan(\frac{\psi}{2}) = \tan(\frac{N\psi}{2})$	[04]	CO2

	(b) On a FR-4 Substrate (ε_r=4.4, tanδ=0.02) of thickness 0.8mm, design a rectangular microstrip patch antenna for Wi-Fi application which has the center frequency (f_0) = 2.45 GHz. Where the co-axial feed should be connected the impedance matching of the antenna?	[04]	CO5
Q8.	(a) Assume that the reflection takes place at a height of 350 km and the maximum density in ionosphere corresponds to a 0.8 refraction index at 15 MHz. What will be the skip distance for which MUF is 20 MHz?	[04]	CO3
	(b) Find the line of sight (LOS) distance between transmitting and receiving antennas of height 100m and 10m, respectively. Take the effect of earth's curvature into the account.	[03]	CO3

It is given that:

$$W = \frac{c}{2f_0\sqrt{\frac{(\epsilon_r+1)}{2}}} \qquad \epsilon_e = \frac{(\epsilon_r+1)}{2} + \frac{(\epsilon_r-1)}{2}\left[1+\frac{10h}{W}\right]^{-1/2},$$

$$L_e = L + 2\Delta L = \frac{\lambda_0}{2\sqrt{\epsilon_e}} = \frac{c}{2f_0\sqrt{\epsilon_e}}$$

R=6370 km

Course Outcomes

CO1: Able to understand the basic operation of E.M. wave based application.
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CO5: To understand the different types of antennas and their applications

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CO1	1(a-e), 2(a-c)	11	61
CO2	6(a), 7(a)	10	61
CO3	1(f), 2(d), 5, 8	16	61
CO4	3, 4	07	61
CO5	6(b), 7(b),	06	61