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Total Number of Pages : 02

B.Tech
PEL5D002

5th Semester Regular Examination 2019-20
ANTENNAS AND WAVE PROPAGATION
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : HR464

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- a) State Huygen's principle.
- b) Differentiate Radian and Steradian.
- c) The radiation resistance of an antenna is 72Ω and loss resistance is 8Ω . What is the directivity in dB if the power gain is 16?
- d) For a 20 turn helical antenna operating at 3GHz with circumference $C = 10\text{cm}$ and the spacing between the turns 0.3λ , calculate the directivity and half power beam width.
- e) What is frequency independent antenna?
- f) Write the Friss transmission formula and define the parameters in it.
- g) Find the critical frequency of an ionosphere layer which has an electron density of $1.24 \times 10^6 \text{cm}^{-3}$.
- h) Define skip distance.
- i) What do you mean by Duct Propagation?
- j) What do you mean by Fading?

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Define the radiation intensity and power density. Derive the relation between these two.
- b) State and prove the power theorem. How power theorem is applied to find the power radiated by an isotropic antenna in terms of its radiation efficiency?
- c) Explain Antenna field zones with a diagram.
- d) Explain the principle of reflector antenna and different type of feed used in reflector antenna.
- e) Explain the radiation from a slot antenna and their feed system.
- f) Explain the principle of Microstrip patch antenna.
- g) A pyramidal Horn antenna with the aperture length of 10λ is fed by a rectangular waveguide in TE_{10} mode. Determine the design parameters of the antenna operating at 2.5GHz.
- h) Write short notes on Binomial array.
- i) Explain the operation and design of helical antenna.
- j) With a neat diagram explain the working of Yagi-Uda antenna in detail with design formulae.
- k) Describe the structure of the Atmosphere and specify factors affecting the radio wave propagation.
- l) Obtain an expression for the refractive index of an ionosphere layer.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Obtain the expression of radiated power and radiation resistance of a half wave dipole. **(16)**
- Q4** With neat Block diagram explain the radiation pattern and gain measurement of Antenna. **(16)**
- Q5** Derive the equation of array factor of a linear array of 4 isotropic element spaced $\lambda/2$ apart fed with signals of equal amplitude and phase. Obtain the direction of minima and maxima. **(16)**
- Q6** **Write the notes on :** **(16)**
Lens Antenna
Spiral Antenna