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10EC64

Sixth Semester B.E. Degree Examination, July/August 2021**Antennas and Propagation**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define the terms related to antenna theory,
i) Effective height ii) Antenna efficiency ii) Directivity. (06 Marks)
b. Obtain an expression for maximum effective aperture of a short – dipole and show its directivity is 1.5. (08 Marks)
c. A low frequency transmitting antenna has a $R_r = 0.5\Omega$ and total los resistance of 2.5Ω . If the current fed to antenna is 100A, calculate the power radiated, input power and antenna efficiency. (06 Marks)
- 2 a. State and prove “Power theorem”. (06 Marks)
b. Obtain directivity of a source given by
$$u = u_m \cos^2\theta \quad 0 \leq \theta \leq \pi/2$$
$$0 \leq \phi \leq 2\pi .$$
 (08 Marks)
c. An end fire array consisting of isotropic radiators is to have a directive gain of 30.
i) Find array length and BWFN ii) Find the above for the broadside array. (06 Marks)
- 3 a. Obtain an expression for radiation resistance of a short dipole. (08 Marks)
b. Draw a typical microstrip antenna and explain its working. Give 3 applications of microstrip antenna. (06 Marks)
c. Explain the construction of a folded dipole element antenna and working principles. (06 Marks)
- 4 a. With suitable diagram, obtain the expressions for E_θ and H_θ , the far field components of a small loop. (10 Marks)
b. Explain the construction and working of a slot antenna. (06 Marks)
c. A loop aerial operating at 500KHz, is of height 0.5m, width 0.5m and 25 turns. The emf induced in the loop is $150\mu V$. When the system is directed to receive maximum signal. Calculate the field strength of the received signal. (04 Marks)
- 5 a. Give the construction of a E-H horn antenna and explain its working by giving proper design equations. (10 Marks)
b. What are frequency independent antennas? Explain with construction, the working of a log-periodic antenna. (06 Marks)
c. A 64m diameter dish antenna, operating at a frequency of 1.43GHz is fed by a non directional antenna. Calculate its i) HPBW ii) BWFN iii) Gain with reference to $\lambda/2$ dipole. (04 Marks)
- 6 a. Write short notes on : i) Embedded antennas ii) Plasma antennas (12 Marks)
b. Draw the ray diagram for a dielectric lens antenna and obtain the equation for radius of curvature ‘R’. (08 Marks)
- 7 a. Derive an expression for tilt angle of ground wave propagation. (08 Marks)
b. Obtain an expression for field strength due to space wave propagation. (08 Marks)
c. A TV transmitting antenna a mounted at a height of 120mt radiates 15KW of power at a frequency of 50MHz. Calculate : i) Maximum line – of – right range ii) Field strength at receiving antenna. For $h_r = 16$ mts at a distance of 12km. (04 Marks)
- 8 a. Discuss various layers of ionosphere showing electron density variation. (08 Marks)
b. Define and explain the terms : i) MUF ii) Skip distance. (08 Marks)
c. For a flat earth, assume that at 400km reflection takes place. the maximum density corresponds to a refractive index of 0.9 at 10MHz. Calculate range for which $f_{muf} = 10$ MHz. (04 Marks)
