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06EC64

# Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
## Antennas and Propagation

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***



## PART – A

1 a. Define the term directivity and effective aperture related to antenna hence derive the relation for directivity D in terms of effective aperture $A_e$. **(08 Marks)**

b. Define the following with respect to antennal parameters
i) Effective height ii) Polarization. **(04 Marks)**

c. A lossless resonant $\lambda/2$ dipole antenna having an input impedance of 73Ω is to be connected to a transmission line having characteristic impedance of 50Ω. The pattern of the antenna is given by $u = u_0 \sin^3\theta$. Find the overall gain of the antenna. **(08 Marks)**

2 a. State and explain power theorem and mention any two its application to point sources. **(04 Marks)**

b. Calculate the directivity of the source with the pattern $u = um \sin\theta \sin^3 \phi$. Using i) Exact method ii) Approximate method. Take $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$. **(08 Marks)**

c. Show that maximum effective aperture of a half wave dipole antenna is $0.13\lambda^2$. **(08 Marks)**

3 a. Explain the principle along with suitable examples of pattern multiplication. **(06 Marks)**

b. Obtain the field pattern for a linear uniform array of 6 isotropic point sources spaced $\lambda/2$ distance apart. The power is applied with equal amplitude and in phase. Find also HPBW and FNBW. **(08 Marks)**

c. Derive an expression for radiation resistance ($R_r$) of a short - dipole. **(06 Marks)**

4 a. A half wave dipole in free space is radiating with a current of 1A (rms value) at the antenna terminals. Find the angle θ for maximum field strength and determine the field strength and power density at a point mile from the antenna at the corresponding angle. **(06 Marks)**

b. A thin linear dipole antenna is $\lambda/2$ long and its loss resistance is 1.2Ω. Find the radiation resistance and efficiency. **(04 Marks)**

c. Write short notes on : i) Folded dipole antenna ii) Thin linear antenna **(10 Marks)**

## PART – B

5 a. Explain Babinet's principle with suitable illustrations. **(06 Marks)**

b. Derive Far field expressions for small loop antenna. **(08 Marks)**

c. Explain microstrip antenna, with neat sketches. Mention its advantages. **(06 Marks)**

6 a. Explain the axial mode pattern and the phase velocity of wave propagation on Monofilar Helical antenna. **(10 Marks)**

b. Explain the operation of log – periodic antenna. **(05 Marks)**

c. Draw the constructional details of an embedded antenna. **(05 Marks)**

7 a. Describe the factors affecting ground wave propagation. **(06 Marks)**

b. Explain clearly the phenomenon of Duct propagation. **(06 Marks)**

c. Derive an expression for wave tilt of surface wave. **(08 Marks)**

8 a. For an ionospheric layers, derive the expression for conductivity and relative permittivity as a function of electron density and angular frequency. **(08 Marks)**

b. Write short notes on the following as related to ionospheric propagation :

i) Virtual height ($h_r$)

ii) Maximum usable frequency ($f_{muf}$).

iii) Critical frequency ($f_c$).

iv) Skip distance ($D_{skip}$). **(12 Marks)**

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