

Total No. of Questions : 8]

P2581

SEAT No :

[Total No. of Pages : 2

[5153]-557

T.E. (E & TC)

ANTENNA & WAVE PROPAGATION
(2012 Pattern) (End-Semester) (Semester-II)

Time : 2½ Hours

Max. Marks : 70

Instructions to candidates:

- 1) All questions are compulsory
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of calculator is allowed.

Q1) a) A uniform plane wave of frequency 5MHz has average poynting vector 1.5 W/m^2 . If the medium is lossless with relative permeability $\mu=2$ and relative permittivity $\epsilon_r=3$. Determine velocity of propagation, wavelength, intrinsic impedance of a medium and r.m.s. value of electric field. [8]

- b) Explain the following characteristics of wireless channel [6]
- i) Coherence band width.
 - ii) Coherence time and.
 - iii) Fading.
- c) Derive vector potential A for an magnetic current source J . [6]

OR

Q2) a) What is polarization of wave? Explain linear and circular polarization of wave. [6]

- b) Write a short note on [6]
- i) Virtual height.
 - ii) Multihope Propagation.

c) The power radiated by a lossless antenna is 10 watts. The radiation intensity of this antenna is $U = U_0 \cos^3 \theta$ (W/Sr) $0 \leq \theta \leq \pi/2$ $0 \leq \Phi \leq 2\pi$. Find. [8]

- i) The maximum power density in (W/m^2) at a distance of 1000 meter (assume for field distance) specify the angle where this occurs.
- ii) Directivity
- iii) Gain of the antenna.

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- Q3) a)** Derive the equation for input impedance and directivity of half wave dipole. [8]
b) Show the current distribution on small dipole and derive the equation for its input impedance. [8]

OR

- Q4) a)** Find the radiation efficiency of a single turn and eight -turn small circular loop at $f=100\text{MHz}$, the radius of the loop is $\lambda/25$, the radius of the wire is $10^{-4}\lambda$ and the turns are spaced $4 \times 10^{-4}\lambda$ apart. Assume the wire is copper with a conductivity of 5.7×10^7 (S/m) and antenna is radiating into free space. (Where ohmic resistance per unit length/ohmic skin effect resistance per unit length=0.38). [10]
b) Give the comparison of far fields of small loop and short dipole. [6]

- Q5) a)** For two element array consisting identical radiators carrying equal currents in phase, obtain positions of maxima and minima of the radiation pattern if the distance of separation $d=\lambda$. [8]
b) Derive antenna array factor for N-element linear array taking the centre element as reference for N is odd and even. [8]

OR

- Q6) a)** Draw and explain the radiation pattern of an endfire array. [8]
b) Explain in brief Dolph - Tchebyscheff distribution. What is the need for Tchebyscheff distribution?. [8]

- Q7)** Explain the following antennas with its structural details dimensions, radiation pattern, diagram, specifications, features and applications. [18]

- Micro strip antenna
- Lens antenna.
- Biconical antenna

OR

- Q8) a)** Explain the working of Rhombic antenna in detail. [8]
b) With the help of suitable diagram explain the operating principle of [10]
i) Super turnstile
ii) Slot antenna.

