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BIEL-013

00592

B. Tech. IN ELECTRONICS AND COMMUNICATION ENGINEERING

Term-End Examination

December, 2011

BIEL-013 : ANTENNAS AND PROPAGATION

Time : 3 hours *Maximum Marks : 70*

Note : *(i) Attempt **any seven** questions. Each question carries **ten** marks*

(ii) Use of scientific calculator is permitted

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1. For an antenna, define the terms Directivity and Gain. Derive the relevant expressions for these parameters. **10**

2. For an antenna of lossless end-fire array compressing 10 isotropic point sources spaced $\lambda/4$ and operating with increased directivity, the normalised field pattern is : **10**

$$E_n = \sin\left(\frac{\pi}{2n}\right) \frac{\sin(n\,\psi/2)}{\sin(\psi/2)}, \text{ where}$$

$$\psi = dr\,(\cos\phi - 1) - \pi/n,$$

$$dr = \pi/2,\ n = 10,\ \text{HPBW} = 40°.$$

Calculate :

(a) Gain G

(b) Approximate gain

(c) Difference between the two

3. Explain the significance of the following with respect to point sources and arrays : **5+5=10**

(a) Field patterns

(b) Phase patterns

4. Prove that the radiation resistance for a short electric dipole with uniform current is given by $R_r = 790L\lambda^2$. Write the equation for its radiated power. **10**

5. Explain Loop Antenna and prove that for a loop antenna with radius 'a' : **10**

$$E\,\phi = \frac{\mu\omega\,[I]a}{2r} J_1(\beta\, a \sin\theta) \text{ and}$$

$$H\,\phi = \frac{\beta\, a\,[I]}{2r} J_1(\beta\, a \sin\theta).$$

6. Write the general properties of a parabolic reflector and compare it with a corner reflector. **10**

7. Explain space wave and surface wave. **3+7=10**

A ground wave of 0.5 mV/m at 20 Km distance is obtained from a transmitter operating at 2MHz. The vertically polarized field produced is proportional to $\cos\theta$, θ is the angle of elevation. Given antenna efficiency = 50%, $\delta = 5 \times 10^{-5}$, $\epsilon r = 15$. Determine E at the transmitting end.

8. Derive a relationship between MUF and skip distance for sky wave propagation. **10**

9. Explain a Turnstile and a super-Turnstile Antenna briefly with relevant diagrams. **10**

10. Write short notes on ***any two*** : **2x5=10**

(a) Plasma Antenna

(b) Slot Antenna

(c) Sleeve Antenna