

**B.Tech. VII Semester (Main/Back) Examination - 2014**  
**Electronics & Comm.**  
**7EC1 Antenna & Wave Propagation**  
**(Common with AI)**

Time : 3 Hours

Maximum Marks : 80  
 Min. Passing Marks : 24

**Instructions to Candidates:**

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

**Unit - I**

1. a) Find the expression of radiated power by Half wave dipole. (10)
- b) What is the effective area of a half wave dipole operating at 500 MHz. (6)

**OR**

1. a) Write the Reciprocity theorem and explain it for two antennas. (6)
- b) The effective antenna temperature of a target at the input terminals of the antenna is 150K. Assuming that the antenna is maintained at a thermal temperature of 300K and has a thermal efficiency of 99% and it is connected to a receiver through an X-band (8.2-12.4 GHz) rectangular waveguide of 10m (loss of wave guide = 0.13dB/m) and at a temperature of 300K, find the effective antenna temperature at receiver terminals. (6)
- c) Write different types of polarization. (4)

**Unit - II**

2. a) The aperture dimensions of a pyramidal horn are 12×6cm. It is operating at a frequency of 6GHz. Find the beam width power gain and directivity. (6)
- b) Explain the working of helical antennas with its features and applications. (10)

**OR**

2. a) Define the characteristics of slot antenna and write the expression of impedance. With the suitable diagrams. Show the feeding methods. (12)

- b) A parabolic reflector with a mouth diameter of 22m. Operates at  $f=5\text{GHz}$  it has illumination efficiency of 0.6. Find the power gain. (4)

**Unit - III**

3. a) Explain the method of polarization measurement of an antenna. (8)  
b) Find the Null - to -Null beam width of end fire array and broad side array.  
i) When the array length  $l = 10\lambda$ ,  $N = 20$   
ii)  $l = 50\lambda$  and  $N = 100$  (8)

**OR**

3. a) Explain the method of phase measurement of an antenna. (8)  
b) Define Binomial arrays. [rtuonline.com](http://rtuonline.com) (4)  
c) An array contains 100 isotropic radiators with an inter element spacing of  $0.5\lambda$ . It is required to produce end fire beams.  
i) Null to Null beam width  
ii) Directivity (4)

**Unit - IV**

4. a) Find the expression for field strength due to space wave. Briefly explain the effect of the curvature of the earth and effect of polarization. (12)  
b) Briefly explain the Duct propagation. (4)

**OR**

4. a) A sky wave is incident on D-layer at an angle of  $40^\circ$ . Find the angle of refraction if the frequency of the transmitted wave is 75MHz. (8)  
b) Define the reflection of radio waves by the surface of the earth also write the field strength of groundwave. (8)

**Unit - V**

5. a) Write the definitions of following (2×5=10)  
i) Virtual height  
ii) Skip distance  
iii) Maximum usable frequency  
iv) Critical frequency  
v) Multi hop transmission

- b) Determine the critical frequency of EM wave for D ( $N = 400 \text{ e/cm}^3$ ) and E ( $5 \times 10^5 \text{ electron/cm}^3$ ) layers. (3)
- c) Determine the range of LOS if the height of the transmitting is 60m and the height of the receiving antenna is 6m (3)

OR

5. a) What is the critical angle of propagation for D layer if the transmitter and receiver are separated by 500km. (6)
- b) Briefly explains the characteristics of different ionospheric layers (6)
- c) Define the effect of earth's magnetic field and solar activity in brief. ( $2 \times 2 = 4$ )