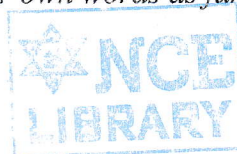


TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2082 Chaitra

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEI	Pass Marks	24
Year / Part	III / I	Time	3 hrs.

Subject: - Propagation and Antenna (ENEX 303)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.



- 1/ List the main properties of antenna. Explain the major required conditions for a simple conductor to be a good antenna. [2+3]
2. State the following antenna theorems: [2+2]
 - a) Compensation theorem
 - b) Reciprocity theorem
- 3/ Derive an expression for the total field in case of two isotropic point sources with equal amplitude and quadrature phase. [5]
- 4/ Define the following antenna parameters: [2+2]
 - a) Fractional Bandwidth (FBW)
 - b) Power flux density (PFD)
5. What is a travelling wave antenna? Explain the working principle and main features of V-antenna with necessary diagrams. [1+4]
- 6/ Design a 5 element Yagi-Uda antenna for receiving UHF band of frequency range from 540 MHz to 548 MHz Assume the driven element is a half-wave folded dipole and take spacing between elements $0.15\lambda_c$. [5]
- 7/ What are the major features of corrugated horn antenna? How does a helical antenna radiate in axial mode? Explain with necessary diagrams. [2+3]
- 8/ What is a direct wave propagation? Explain the different factors that affect the space wave propagation. [1+3]
9. Derive the Friis transmission equation and find out the free space path loss from the equation that is equal to $22+20\log(R/\lambda_c)$ in dB where R is distance between transmitting and receiving antennas and λ_c is wavelength of the frequency being used. [3+2]
- 10/ Define the virtual height of the ionosphere and derive the expression for relation between the skip distance (D) and critical frequency (f_{crit}) assuming Earth is not curve. [1+5]
11. A ground station located at 42.7° N latitude and 108.3° E longitude need to establish a Ku-band uplink to a GEO satellite positioned at 128° E longitude. The satellite's receiver has a G/T of 4.8 dB/K and the desired C/N_0 is 107 dBHz. The ground station employs a parabolic antenna with a diameter of 7.8 m, an antenna efficiency of 75% and waveguide loss of 1.6 dB. Determine the minimum transmit power that the ground station must provide to achieve the required C/N_0 , accounting for the actual Earth-satellite slant distance. [8]
12. Write short notes on (Any Two): [2×2]
 - a) Smart Antennas
 - b) Duct propagation
 - c) Knife edge diffraction