

328553(28)

**B. E. (Fifth Semester) Examination, April-May/
Nov.-Dec. 2020**

(New Scheme)

(Et&T Branch)

ANTENNAS & WAVE PROPAGATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any two parts from (b), (c) and (d) of each questions and they carry 7 marks each. Assume suitable data wherever necessary.

Unit-I

1. (a) Define the phase velocity & group velocity. 2

- (b) Derive the field component for TE waves in a metal of two infinite parallel plates. 7

[2]

- (c) What do you mean by the dominant mode? A rectangular waveguide has dimensions of 2.5 cm and 5 cm. Determine the guide wavelength, phase constant (β) and phase velocity at a wavelength of 4.5 cm for the dominant mode. 7
- (d) Define cut off frequency and calculate the cut off frequencies for the TE_{01} , TE_{11} and TM_{12} modes in a rectangular metal waveguide of dimensions 2 cm \times 1 cm. 7

Unit-II

2. (a) Define maximum usable frequency (MUF). 2
- (b) What is LOS (Line of sight) propagation? How does it differ from ground wave and sky wave propagation? Explain the term 'fading'. 7
- (c) Explain ground based duct propagation. What is an elevated duct? 7
- (d) (i) A TV transmitter antenna has a height of 169 meters & receiver antenna has a height of 16 meters. What is the max. distance through which the TV signal could be received by space wave

[3]

- propagation? What is the radio horizon in this case. 4
- (ii) The field strength at a distance of 20 km from a 150 kW microwave broadcast transmitter employing a short vertical antenna, assuming that the field strength value is 300 mV/m at a distance of 1 km from T_x for a radiated power of 1 kW. 3

Unit-III

3. (a) What is short electric dipole? 2
- (b) Deduce an expression for the radiation field of a half wave dipole antenna. 7
- (c) Define directivity and effective aperture of antenna. Derive the relation between max. aperture and directivity. 7
- (d) State and explain reciprocity theorem as applied to antenna. 7

Unit-IV

4. (a) What is meant by collinear array? 2

- (b) Deduce expression for the radiation pattern of array two point source with equal amplitude and phase and also direction of maximum, minimum and half power point. 7
- (c) Derive the equation of direction of pattern max. radiation & direction of pattern minima radiation for array of n isotropic source of equal amplitude and spacing (end fire case). 7
- (d) Write short note on Binomial arrays. 7

Unit-V

5. (a) Define non-resonant antenna. 2
- (b) Write short note on Rhombic Antenna. 7
- (c) With a suitable diagram discuss the construction and operation of a Yagi Antenna. 7
- (d) Explain the distinguishing features of Log Periodic Antenna. In which frequency range it is being used? 7