13486

[Time: Three Hours] [Marks:80]

N.B: 1. Question number one is compulsory
2. Attempt any three out of remaining

Q.1 **Attempt any FOUR:** (20)

a. Derive wave equation for electric fields.
b. Define the terms near field and far field for antenna
c. Derive continuity equation for electric fields
d. Explain ground wave propagation
e. Why Maxwells equations need to be modified for time varying fields

Q.2
a. Define loop antenna. Mention the disadvantages of loop antenna (10)
b. Design rectangular micro strip antenna for 2.4 GHZ frequency using PR-4 Substrate of dielectric value 4.4 & thickness 1.6mm. (10)

Q.3
a. Compare broadside and end fire array. (10)
b. Derive FRIIS Transmission Equation & Explain its Significance (10)

Q.4
a. With neat sketch explain parabolic Reflector antenna. List feed mechanism used (10)
b. Derive wave equations for magnetic fields and explain what is TEM wave (10)

Q.5
a. Explain H-plane sectoral horn a antenna and describe various configuration of horn (10)
b. antenna (10)
What are the advantages of array antenna? Describe principle of pattern multiplication and sketch radiation pattern of a 3-element array separated at $\lambda/2$

Q.6 Write short notes on (any four questions, each carry five marks) (20)

a) Sky wave propagation
b) Power in EM wave
c) Retarded potential
d) Equivalent noise temperature of antenna
e) Radiation pattern

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Sem VI / Extc IRIa / EA / (15) 07/12/22