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SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No.: | | | | | | | | | | |

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## B.Tech. Electronics and Communication Engg.( Semester-5th)

# Antenna & Wave Propagation

Subject code: BTEC-502A
Paper ID: [ ]

Batch: 2015 onwards.

**Time allowed: 3 Hrs.** **Max. Marks: 60**

**Important Instructions:**

- All questions are **compulsory**.
- Assume any missing data.

### PART– A (2 x 10)

**Q1)** a) What is Hertizian dipole?

b) What is loss tangent?

c) How does antenna radiate electromagnetic energy?

d) State Babinet's principle.

e) What do you mean by isotropic radiator?

f) Calculate the radiation resistance of a $\lambda/12$ dipole.

g) What do you mean by array factor?

h) What do you mean by TE, TM and TEM waves?

i) What is Characteristics impedance?

j) Calculate the critical frequency for reflection of the wave by ionosphere, if the maximum value of electron density is $1.24 \times 10^6$ cm$^{-3}$.

### PART – B (8 x 5)

**Q2)** Differentiate the following:

- Radiating field and induction field of antenna
- HPBW and FNBW (CO1)

**OR**

Distinguish between Gain and Directivity. Derive a relationship between Directivity and effective aperture. (CO1)

**Q3)** What is broadside array? Derive the expression for angles of nulls, maxima and half power points. (CO2)

**OR**

Discuss the Binomial array in detail with help of an example. (CO2)

**P.T.O.**

**Q4)** What is radiation pattern? Describe different radiation patterns and lobes of radiation. (CO1)

**OR**

Derive an expression for far-field components and radiation resistance for short dipole. (CO1)

**Q5)** What is the Field equivalence principle? Discuss it in detail. (CO3)

**OR**

Discuss different shapes of Horn antenna and explain how it can act as an impedance matching antenna and what are its applications? (CO3)

**Q6)** Give the circuit representation of parallel plane transmission line and obtain the transmission line parameters for high frequencies. Discuss TE and TM waves in rectangular waveguides in brief (CO4)

**OR**

Define the following: Critical frequency, Skip Distance and Maximum Usable Frequency. Derive an expression between Skip Distance and Maximum Usable Frequency. (CO4)

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