

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09]

Uni. Roll No. ....

EVENING

04 JAN 2023

[Total No. of Pages:02]

Program: B.Tech. (Scheme 2018)

Semester: 5<sup>th</sup>

Name of Subject: Antenna and Wave Propagation

Subject Code: PCEC-113

Paper ID:16420

Scientific calculator is allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
- 3) Any missing data may be assumed appropriately.

[Marks: 02 each]

**Part – A**

**Q1.**

- a) Define "Superdirective array".
- b) Write two advantages of array tapering.
- c) Define the terms: (1) Critical frequency (2) Maximum usable frequency
- d) Describe Babinet's principle.
- e) Cite two differences between radiation field and induction field.
- f) Compute the range of space wave propagation with heights of transmitting and receiving antennas equal to 100m each.

[Marks: 04 each]

**Part – B**

- Q2.** Discuss in detail the phenomena of duct propagation.
- Q3.** Describe the 'cassegain' method of feeding a parabolic reflector.
- Q4.** Given a linear, uniform array of 10 isotropic elements with a separation of  $\lambda/4$  between the elements. Compute the directivity for the following arrays: (i) Broadside array (ii) Ordinary endfire array (iii) Hansen Woodyard endfire array
- Q5.** Determine the radiation resistance of an antenna having a loss resistance of  $10\Omega$ , power gain of 20 and directivity 22.

- Q6. Explain the radiation mechanism in a two wire transmission line.
- Q7. With the use of pattern multiplication technique, draw the radiation pattern of eight (8) isotropic sources with spacing  $\lambda/2$  and in phase.

Part – C

[Marks: 12 each]

- Q8. Derive the expression for radiation resistance of an infinitesimal dipole.

OR

With the aid of neat sketch, discuss in detail the characteristics of various layers of 'Ionosphere'

- Q9. (a) Distinguish between E-layer and Sporadic E-layer.

- (b) Given  $N=400 \text{ e}^-/\text{cc}$ , determine the frequency at which a wave must propagate for the D-layers to have refractive index of 0.5.

OR

Discuss in detail the factors that affect the field strength of space wave signal.

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