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December 2023

B.Tech. (ECE) VIIth SEMESTER

Antenna & Propagation (ECEL701)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) For isotropic radiator find the radiation intensity U_o when power radiated is P_{rad}. (1.5)

(b) What are frequency independent antennas? What are their applications? (1.5)

(c) What is the radiation pattern and impedance of a small loop antenna? (1.5)

(d) What is cassegrain feed? What are its advantages? (1.5)

(e) What is broadcast antenna? Give example. (1.5)

(f) What is smart antenna? What are its benefits? (1.5)

(g) What is planar array? What is its significance? (1.5)

(h) What are different modes of radio wave propagation? (1.5)

(i) An antenna has a radiation resistance of 72 ohms, loss resistance of 8 ohms and power gain of 12 dB. Determine the antenna efficiency. (1.5)

(j) What is array Tapering? (1.5)

PART–B

2. (a) Explain the radiation from two wire antenna and also describe in detail the current distribution on thin wire antenna. (10)

(b) Explain the significance of the term "Effective area of the antenna". Derive the relationship between effective area and directivity of any antenna. (5)

3. (a) State Huygen's principle. Explain its significance in antenna theory. (5)

(b) Explain in detail the fixed weight beam forming and adaptive weight beam forming. (10)

4. Derive the expression for far field of half wave dipole. Also find its radiation resistance using the far field. (15)

5. (a) Explain the Schelkunoff polynomial method of array synthesis. (5)

(b) Design an ordinary end fire array with one maxima such that its directivity is 20 dB. The spacing between elements is $\lambda/4$ and the length is much greater than spacing. Determine. (10)

(a) No. of elements

(b) Overall length of array :

(c) Approximate HPBW

(d) Progressive phase shift between element

(e) Ratio of level of first minor lobe compared to major lobe

6. (a) What is operating principle of log periodic antenna? Derive the basic formula used to design log periodic antenna. What are different design choices? (10)

(b) Design a six element yagi-uda antenna covering the UHF (512-806 MHz) and gain of the antenna is 12 dB. (5)

7. (a) Design a rectangular microstrip antenna using a dielectric substrate with dielectric constant of 2.2, h=0.1588 cm so as to resonate at 10 GHz. (10)

(b) Compare the various feeding methods of microstrip patch antenna. (5)