

Time : 3 Hours]

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[Total Marks : 100
 [Min. Passing Marks : 33

Attempt any five questions.

Marks of questions are indicated against each question.

Draw neat and comprehensive sketches wherever necessary to clearly illustrate your answer.

Assume missing data suitably if any and specify the same.

Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)

1. Nil 2. Nil

1 The E-field pattern of an antenna independent of ϕ , varies as follows :

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$$E = \begin{cases} 1 & 0^\circ \leq \theta \leq 45^\circ \\ 0 & 45^\circ \leq \theta \leq 90^\circ \\ \frac{1}{2} & 90^\circ < \theta \leq 120^\circ \end{cases}$$

- (a) What is the directivity of this antenna ?
 (b) What is the radiation resistance of the antenna at 200 m from it if the field is equal to 10 V/m (rms) for $\theta = 0^\circ$ at that distance and the terminal current is 5A (rms).

2x10=20

2 Design and calculate its HPBW and directivity of a broadside Dolph-TschebyScheff array having no. of element 7 and spacing $d = \lambda$ between the elements. Consider the major to minor ratio 20 dB.

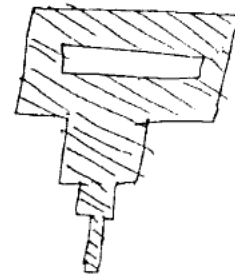
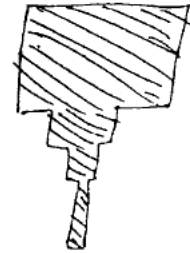
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10+2x5=20

3 (a) Deduce the condition for an antenna that make it frequency independent. How we realize the practical structure for such antenna. give any two example.

5+5+2=12

(b) Draw the electrical equivalent for following microstrip structure. rtuonline.com



2x4=8

4 The TE₁₀-mode distribution aperture on ground plane has

$$E_a = \hat{a}_y E_0 \cos\left\{\frac{\pi}{a} x'\right\} \begin{cases} -a/2 \leq x' \leq a/2 \\ -b/2 \leq y' \leq b/2 \end{cases}$$

Calculate its far field components and FNBW. Also find its directivity.

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10+2x5=20

- 5 (a) Explain the Basinet's Principle and its application for find antenna parameter. What is the fundamental limitation for it ?
 (b) Find the input impedance for a microstrip antenna with overall dimensions $L = 0.900$ cm $W = 1.1800$ cm substrate height $h = 0.10$ cm and $E_r = 2.5$ and operating frequency 12 GHz.

3+4+3=10

10

- 6 (a) Draw the
 (i) E and H plane pattern for microstrip patch slot.
 (ii) Field configuration for rectangular microstrip patch.

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2x5=10

(b) Design a circular microstrip antenna using a substrate of $E_r = 4.6$ and its height is $h = 0.18$ cm. The resonant frequency is 4.2 GHz.

7 Write short notes on any two :

- (i) Reconfigurable Antenna
- (ii) Beam efficiency
- (iii) Field equivalence principle
- (iv) Different mode in Helical Antenna
- (v) Impedance matching in microstrip Antenna.