KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Sixth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE115:Antennas and Wave Propagation

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The size of the antenna is --------------

   a) Inversely proportional to frequency   b) Directly proportional to frequency

   c) Independent of frequency   d) Inversely proportional to the square of the frequency

2. The efficiency of an antenna is given by

   a) Rrad/(Rrad+Rloss)   b) R_{loss}/(Rrad+Rloss)

   c) (Rrad+Rloss)/R_{rad} d) (Rrad+Rloss)/R_{loss}

3. The physical height of half wave dipole having quality factor of 40 and bandwidth of 20 MHz is -----------

   a) 0.1875m   b) 0.25cm

   c) 0.25m   d) 0.5 cm

4. The radiation resistance of a short dipole whose length is $\lambda/25$-----------------

   a) 1.36 Ω b) 1.46 Ω

   c) 1.26 Ω d) 2.26 Ω

5. Condition for the helical antenna to operate in axial mode_____.

   a) C=λ & S=$\lambda/4$ b) C=$\lambda/2$ & S=$\lambda/4$

   c) C=$\lambda/2$ & S=$\lambda/2$ d) C=$\lambda/4$ & S=$\lambda/4$

6. In Yagi-Uda antenna ,the phase and current flowing due to induced voltage depends on --------

   a) Length of the elements   b) Spacing between the elements

   c) Both a & b   d) Diameter of conductors

7. Shortening of a $\lambda/2$ slot antenna makes it more-------------

   a) Resistive   b) capacitive

   c) Inductive   d) No change

8. The directivity of rectangular aperture antenna is-------------.

   a) $11.56\ A/\lambda^2$ b) $12.56\ A/\lambda^2$

   c) $13.56\ A/\lambda^2$ d) $14.56\ A/\lambda^2$

9. The ionizing agent present in F_1 layer is -----------------

   a) Soft X ray radiations   b) Oxygen atoms

   c) UV rays   d) Alpha rays

10. The range of space wave propagation is ------------km

    a) $[\sqrt{h_t} + \sqrt{h_r}\ ]$ b) $5.12\ [\sqrt{h_t} + \sqrt{h_r}\ ]$

    c) $4.12\ [\sqrt{h_t} + \sqrt{h_r}\ ]$ d) $h_t + h_r$

PART B (10 x 2 = 20 Marks)

11. Define radiation pattern of an antenna.Mention is different lobes

12. Compare Broadside array and end fire array.

13. Compare electric scalar potential and magnetic vector potential

14. Determine the magnitude of E and H radiation from a half wave dipole operated at a distance of 100 m in the broadside plane for maximum radiation. Peak Input current to the antenna is10 A.

15. What is a parasitic Element? How does it act when length isgreater than and less than $\lambda/2$?

16. What are the different modes of operation that can be used in Helical antenna

17. Mention the advantages and uses of lens antenna

18. Estimate the diameter and the effective aperture of a parabolaidal reflector antenna

19. What is meant by diversity reception?Mention the types

20. Determine the critical frequency of an ionized layer if the maximum value of electron density is $1.24\times10^6\ cm^{-3}$

PART C (5 x 14 = 70 Marks)

21. a) (i) Define Effective aperture .Derive the relationship between directivity gain and effective aperture.   (7)

      (ii) State and prove reciprocity principle with regard to antennas.   (7)

(OR)

b)   Analyze and derive the expression for the far field pattern of an array of 2-isotopic point sources fed with the current of

i)Equal amplitude and phase.

ii) Equal amplitude and opposite phase.

22.   a)   Analyze and derive the fields radiated from a half wave dipole antenna? Also obtain the radiated power and radiation resistance of half wave dipole

(OR)

b)   Analyze and derive the expression for the electric and magnetic fields due to a hertzian dipole at a distance point in free space

23.   a)   Explain the construction, operation and design of a rhombic antenna? Also mention its advantages, disadvantages and applications.

(OR)

b)   (i)   Explain the geometry and working principle of a log periodic antenna?   (7)

     (ii)   Explain the methods of measuring antenna radiation pattern.   (7)

24.   a)   Analyze and derive the expressions for fields radiated from an elemental area of a plane wave.

(OR)

b)   (i)   Analyze and derive the relationship between dipole and slot impedances   (7)

     (ii)   Explain the methods of feeding parabolic reflectors   (7)

25.   a)   (i)   Explain in detail about ionospheric wave propagation. Also explain the various layers of ionosphere.   (7)

     (ii)   Discuss the effects of earth's magnetic field on ionosphere radio wave propagation   (7)

(OR)

b)   What is Space Wave propagation? Analyze and derive the expression for the resultant field due to space wave. Compare space wave propagation with ground wave propagation.

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