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Question Paper Code	12172
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023**  
Seventh Semester  
**Electronics and Communication Engineering**  
**EC8701 - ANTENNAS AND MICROWAVE ENGINEERING**  
(Regulations 2017)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |  | <i>Marks,<br/>K-Level, CO</i> |
|--|-------------------------------|
| 1. Define gain of antenna.   | <i>2,K1,CO1</i>               |
| 2. Illustrate the significance of G/T calculation.                         | <i>2,K2,CO1</i>               |
| 3. Identify any two applications of loop antenna.                          | <i>2,K2,CO2</i>               |
| 4. Calculate the length of Half wave dipole operating at frequency 30 MHz. | <i>2,K3,CO2</i>               |
| 5. Examine Faraday rotation.   | <i>2,K1,CO4</i>               |
| 6. Define reflective attenuators.  | <i>2,K1,CO4</i>               |
| 7. State hull-off condition.   | <i>2,K1,CO5</i>               |
| 8. Describe the condition for oscillation in the reflex klystron.          | <i>2,K2,CO5</i>               |
| 9. Define conversion loss.   | <i>2,K1,CO6</i>               |
| 10. Identify the function of a mixer.                                      | <i>2,K1,CO6</i>               |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

11. a) (i) An antenna has a field pattern given by  $E(\theta) = \cos\theta \cos 2\theta$  for  $0^\circ \leq \theta \leq 90^\circ$ . Compute (a) HPBW (b) FNBW. *7,K2,CO1*
- (ii) Explain the concept of radiation pattern and directivity of an antenna. *6,K2,CO1*

**OR**

- b) Using Friss transmission formula, estimate the maximum power received at a distance of 1 Km over a free space. A 100 MHz circuit consisting of a transmitting antenna of 30 dB gain and a receiving antenna with a 25 dB gain is used. The power input to the transmitting antenna is 150 W. *13,K2,CO1*
12. a) Compare different types of horn antenna structures with neat diagrams. Also determine its directivity and beam width. *13,K2,CO2*

**OR**

b) Explain in detail about the feeding structure of parabolic reflector antennas. *13,K2,CO2*

13. a) Summarize the principles and derive the scattering matrix of a directional coupler. *13,K2,CO4*

**OR**

b) Explain the working of magic Tee with neat diagram and also obtain its scattering matrix. *13,K2,CO4*

14. a) Determine the working principle of Gunn diode as a transferred electron device with two valley models. Also draw the structure, equivalent circuit and V-I characteristics of Gunn diode. *13,K2,CO5*

**OR**

b) Describe velocity modulation and explain the working principle of reflex klystron and bunching parameter. *13,K2,CO5*

15. a) Describe the characteristics of amplifier and examine the transducer power gain, unilateral power gain, available power gain and operating power gain of a microwave amplifier using S parameters. *13,K2,CO6*

**OR**

b) Explain about LNA in detail with neat diagrams. *13,K2,CO6*

**PART - C (1 × 15 = 15 Marks)**

16. a) Trace the radiation pattern of a linear array of 4 isotropic elements spaced  $\lambda/2$  apart and fed in phase with equal currents. *15,K2,CO3*

**OR**

b) Explain binomial array. Draw the pattern of 10 element binomial array with spacing between the elements of  $3\lambda/4$  and  $\lambda/2$ . *15,K2,CO3*