

IV B. TECH I SEMESTER REGULAR EXAMINATIONS, NOVEMBER - 2023
RADAR ENGINEERING
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 hours

Max. Marks: 70

Note : Answer ONE question from each unit (5 × 14 = 70 Marks)

~~~~~

UNIT-I

1. a) What is the range (nmi) of this ground-based air-surveillance radar if it has to detect a target with the radar cross section of  $2 \text{ m}^2$  when it operates at a frequency of 2.4 GHz (S band), with a rectangular-shaped antenna that is 6 m wide, 6 m high, antenna aperture efficiency  $\rho_a$  of 0.8, and minimum detectable signal  $S_{\min}$  equal to  $10^{-16} \text{ W}$  (Assume  $P_t = 200 \text{ KW}$ )? [7M]
- b) List and explain different types of losses. Discuss the significance of radar frequencies and their relevance in different radar applications. [7M]

(OR)

2. a) Provide a detailed derivation of the radar range equation. Explain the radar range equation and its significance in radar systems. [7M]
- b) Describe: probability of detection and probability of false alarm. Analyze the challenges related to signal detection in the presence of noise in radar systems. [7M]

UNIT-II

3. a) What are called blind speeds in MTI radar and suggest a mechanism to reduce the blind speeds effectively. [7M]
- b) Explain the FM-CW altimeter along with its block diagram and show the characteristics of FM-CW Radar. [7M]

(OR)

4. a) Show the Block diagram of MTI Radar and explain its working principle. [7M]
- b) Derive the expression for frequency response function of a single delay line canceller. [7M]

UNIT-III

5. a) Describe the Sequential lobing tracking Radar with a neat sketch. [7M]
- b) Explain the operation of phase comparison Monopulse RADAR System. [7M]

(OR)

6. Explain various radar tracking techniques, including mono-pulse tracking, sequential lobing, and conical scan. Compare and contrast these techniques. [14M]

UNIT-IV

7. a) Briefly explain the concept of beam steering of Phased array antennas. [7M]  
b) Explain the significance of radar antennas in radar systems. [7M]

(OR)

8. a) Explain the working of parabolic reflector and different feeds used. [7M]  
b) Explain the operation of electronically steered phased array antennas and their applications. [7M]

UNIT-V

9. a) Discuss working of Direction Finder (ADF) as a navigational aid in aviation. [7M]  
b) Explain the Very High-Frequency Omnidirectional Range (VOR) system and its role in aviation navigation. [7M]

(OR)

10. a) Describe the different types of radar displays used in radar systems. What are the characteristics and applications of each type? [10M]  
b) List the key components of a radar receiver and their functions in the radar system. [4M]

\* \* \* \* \*