

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
IV B. Tech I Semester Regular/Supplementary Examinations October 2025
RADAR ENGINEERING
(ECE)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks

UNIT-I

1. a) With a neat block diagram, explain the basic components and operation of radar system. [7M]
b) Derive the simple radar range equation and solve an example to find maximum range for given parameters. [7M]
(OR)
2. a) Derive the modified radar range equation including system losses and explain each term. [7M]
b) Calculate the SNR and minimum detectable signal for a radar operating at 10 GHz with a transmitter power of 200 kW. [7M]

UNIT-II

3. a) Explain the working principle and block diagram of CW radar in detail. [7M]
b) Derive the Doppler frequency equation and solve for a target moving at 400 m/s at 5 GHz. [7M]
(OR)
4. a) With a neat diagram, explain FM-CW radar for range and velocity measurement. [7M]
b) Given a frequency deviation and modulation rate, compute the altitude measured by an FM-CW altimeter? [7M]

UNIT-III

5. a) Explain the principle and operation of MTI radar using power amplifier transmitter. [7M]
b) Derive the expression for blind speed and find its value for a PRF of 1 kHz and wavelength of 0.03 m. [7M]
(OR)
6. a) Differentiate between MTI and Pulse Doppler radar? [7M]
b) For a given PRF and Doppler frequency, determine the range and velocity ambiguities? [7M]

UNIT-IV

7. a) Explain sequential lobing and conical scan techniques used in tracking radar. [7M]
b) Describe the amplitude comparison mono-pulse radar and show how error signals are generated. [7M]
(OR)
8. a) Explain the phase comparison mono-pulse radar and derive the angle error equation [7M]
b) Discuss scanning patterns and acquisition process in tracking radars. [7M]

UNIT-V

9. a) Derive the matched filter response for a rectangular pulse and determine the SNR improvement factor? [7M]
b) Explain correlation detection and cross-correlation receiver methods for radar signal detection. [7M]
- (OR)
10. a) Explain the working of radar duplexers and circulators. [7M]
b) Discuss the principle of phased array antennas and calculate the beamwidth for a 1 m aperture at 10 GHz? [7M]
