

Radar Systems

Unit-1:

1. What is RADAR? Explain the working principle of conventional Pulse Radar with neat diagram?
2. Derive the simple radar range equation? How does the radar range vary with the Radar wavelength, everything else being the same? Explain?
3. Explain about applications of radar
4. (a) Write notes on "Integration of Radar Pulses".
(c) Determine the peak power and duty cycle of radar whose average transmitter power is 100W, pulse width of $0.5\mu\text{s}$ and pulse repetition frequency of 2000 Hz.

Unit-2:

1. What is Doppler frequency shift? Establish a relation between Doppler frequency shift and radial velocity of a moving target.
2. (a) Explain the operation of a FM-CW altimeter using a block diagram.
(b) Determine the range and Doppler velocity of the target if the target is moving away from a FM continuous wave radar. The beat frequency observed for triangular modulation as $f_b(\text{up})=50\text{KHz}$ and $f_b(\text{down})=20\text{KHz}$. The modulating frequency is 2MHz and Doppler shift is 2KHz.
3. With the help of a suitable block diagram, explain the operation of a CW radar with non-zero IF in the receiver.
4. (a) Calculate the Doppler frequency of stationary CW Radar transmitting at 4GHz when a moving target approaches the radar with a radial velocity of 90 km/hour. [C415.2] [BT-III] [7M]
(c) Write short notes on limitations of CW radar.

Unit-3:

1. What is the difference between single cancellation and double cancellation in delay line cancellers? Explain.
2. (a) Calculate the lowest blind speed of an MTI system operating at 3.6 cm wavelength and transmitting at a pulse repetition time of $330\mu\text{s}$.
(b) Explain about range gated Doppler filters.
3. (a) An MTI radar receiver indicated a Doppler shift from an automobile as 1 KHz. The radar is operating at a frequency of 10 GHz with a PRF of 1 KHz. Find the speed of the automobile.
(b) Draw the block diagram and explain the working of MTI radar with power amplifier transmitter
4. (a) Explain about Non-coherent MTI radar

(b) Two MTI radars operate at different frequencies but at the same PRF. If the first blind speed of first MTI radar is equal to the third blind speed of second MTI radar, determine ratio of the operating frequencies of the two radars.

Unit-4:

1. a) Explain the limitations of MTI performance?
b) Briefly explain the tracking techniques with radar?
2. a) Explain the working principle and function of each block in power amplifier transmitter in MTI Radar?
b) Explain the function and necessity of non coherent MTI radar?
3. a) What is an A-scope display? How it generate butterfly effect in MTI Radar system?
b) Explain the function of pulse Doppler radar and how it is different from simple pulse radar?
4. Explain the function of each block in range-gated Doppler radar?

Unit-5:

1. a) Briefly explain about reflector antennas?
b) Explain about Cosecant Squared Antenna Pattern?
2. Explain the working of each block in mono pulse two-angle co-ordinate system?
3. Explain the types of feed techniques in radar system?
4. a) Explain the function of low-angle tracking system?
b) List out the functions of the radar antenna?

Unit-6:

1. a) Derive the noise figure of the 2-cascaded network?
b) Explain the working principle of Balanced type Duplexer?
2. a) Explain the working principle of Branch –type duplexer?
b) Derive the effective noise temperature of N-antenna system?
3. a) Write short notes on constant false alarm rate receiver?
b) Briefly explain types of displays?
4. a) Design a duplexer with a circulator?
b) What is a radome? What are the applications with radome?