Set I

1) (a) Derive the simple form of RADAR equation

(b) Discuss in detail about the receiver noise and SNR, as applicable to RADARS

Obtain the modified form of RANGE equation

2) (a) CW transmitter of frequency 5 GHz, Calculate the Doppler frequency seen by stationery RADAR, when target radial velocity is 100 kmph.

(b) Explain the principle of FM CW RADAR with relevant waveforms.

3) (a) Explain the operation of MTI RADAR with power amplifier transmitter block diagram.

(b) What is a delay line canceler? Obtain the frequency response of single delay line canceler and explain.

Set-II

1) (a) Draw the block diagram of basic RADAR system and explain the function of each block.

(b) Consider an L-band RADAR with following specifications:

Operating frequency :- 1000 MHz

Bandwidth :- 3MHz

Gain :- 5000

Calculate Peak power, Pulse Width and the minimum detectable signal for the RADAR. Assume target RCS $10m^2$, (Radar cross section) single pulse SNR (15.4 dB), Noise figure 6 dB, Noise temperature 290 K. and maximum range 200 km.

2) (a) Explain the operation of non-zero IF receiver with a block diagram.

(b) Determine the range and doppler velocity of the target if the target is moving away from FM C RADAR. The beat frequency observed

for Triangular modulation f_{bu} = 50 kHz and f_{bd} = 20 kHz, Modulation frequency 2 MHz and Doppler shift 2 kHz.

3) (a) What are blind speeds?, obtain the expression for nth blind speed and first blind speed?

(b) Calculate the lowest blind speed of an MTI system operating at 3.6 cm wavelength and transmitting at a pulse repetition time of 330 μseconds?

Set-3

1) (a) Explain various applications of RADAR

(b) What are the various system losses in RADAR? Explain in detail.

2) (a) Explain how isolation is provided between the transmitter and receiver of CW RADAR.

(b) Evaluate the relation between doppler frequency and velocity of a target in

CW RADAR

5) (a) Explain the concept of multiple or staggered PRFs in MTI RADAR.

(b) Discuss the factors that limit the performance of MTI system.