





- xi) Surface acoustic wave dispersive delay line is used as
- a) amplifier for the received echo signal
  - b) pulse compression filter for linear FM
  - c) Doppler filter
  - d) None of these.
- xii) TWT uses slow wave structure to
- a) increase the number of electrons
  - b) decrease number of electrons
  - c) decrease the RF signal power
  - d) decrease the velocity of RF signal.

### **GROUP – B**

#### **(Short Answer Type Questions)**

Answer any *three* of the following.

3 x 5 = 15

2. What do you understand by the term dwell time? For a ground based search Radar having  $\theta_B = 1.5^\circ$ ,  $f_p = 300 \text{ Hz}$  and  $\theta_S = 30^\circ/s$  determine the number of hits ( No. of pulses from a point target in each scan ( derive the formula used).
3. What is the highest frequency on which radar can be operated if it is required to have a maximum unambiguous range of 200 nmi and no blind speed less than 600 km/hr. Explain the results due to blind speed.
4. Explain the simple coordinate system in RADAR.
5. Explain the basic of sequential lobing and simultaneous lobing angle tracking system.
6. Explain the significance of staggered PRF and its advantages.
7. Explain the ways by which detection of targets using lower frequency and polarization in clutter is done.

### **GROUP – C**

#### **(Long Answer Type Questions)**

Answer any *three* of the following.

3 x 15 = 45

8. a) Derive the fundamental range equation considering receiver noise. What are the reasons for the failure of the simple form of the radar equation?
- b) Explain the antenna parameters like Gain (  $G$  ) and radar cross-section of target (  $\sigma$  ).
- c) What do you mean by false alarm? Derive a relation between probability of false alarm (  $P_{fa}$  ) and average time between false alarms (  $T_{fa}$  ). (5+1)+4+(2+3)
9. a) What is Doppler effect? Derive expression for Doppler frequency shift.
- b) With a suitable block diagram explain the operation of MTI radar with power amplifier transmitter.
- c) Show that a double delay line canceller is equivalent to a three-pulse delay line canceller. (2+2)+7+4
10. a) Draw the block diagram of monopulse tracking radar in one angle coordinate and explain its operation.
- b) Discuss the major effects ( gain, receiver noise and amplitude fluctuation of target echoes ) that determine the accuracy of tracking radar. 10+5
11. a) What is clutter? What are the different types of clutter?
- b) Define different kinds of angle for look down mode radar system.
- c) Derive and explain Surface-clutter Radar equation. (2+2)+3+8
12. a) What are Duplexers? Explain their significance in typical radar and its types.
- b) Briefly explain the operation of Klystron.
- c) Compare TWT amplifier with Klystron amplifier.

3+8+4

13. Write short notes on any *three* of the following:

3 x 5

- a) ESM
- b) ECM
- c) Stealth techniques
- d) Range and velocity ambiguities
- e) Super-heterodyne radar receiver

=====