

**BT-8 / M -15**  
**RADAR ENGINEERING**  
**Paper-ECE-404 E Opt. (II)**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Attempt any five questions by selecting at least one question from each section.*

**Section-I**

1. (a) Derive simple form of radar equation with necessary expressions. 12
- (b) If the transmitted peak power of radar is 100kW, pulse repetition frequency is 1000 pps and the Pulse width is 1  $\mu$ s then calculate the average power in db. 8
2. (a) Explain the Pulse Repetition Frequency and Range Ambiguities. 10
- (b) A radar operating at 10GHz with the peak power of 500kW. The power gain of antenna is 5000 and minimum power of receiver is  $10^{-14}$ . Calculate the maximum range of radar if the effective area of antenna is  $10\text{m}^2$  and radar cross section is  $4\text{m}^2$ .

**Section-II**

3. (a) Explain Range Gated Doppler Filters used for MTI radars using necessary block diagram and response characteristics in detail. 10
- (b) If two MTI radar systems are operating at the same pulse repetition frequencies but with different operating

frequencies and the 2<sup>nd</sup> blind speed of one is equal to fourth speed of the other then find the ratio of their operating frequencies.

4. (a) Explain the working of Non-Coherent MTI Radar with necessary Block diagram. 8
- (b) Compare the working of FM-CW radar with necessary diagrams and applications. 8
- (c) The MTI radar is used by a traffic control police to measure the speed of vehicles. If the doppler frequency shift measured from the moving vehicle is 1.5 KHz, calculate the speed of the vehicle, if radar is operating at 1GHz with PRF of 1000 Hz. 4

### Section-III

5. (a) Describe the Sequential Lobbing method of tracking of an acquired target. 10
- (b) Define Tracking in range and explain split gate tracker method. 10
6. (a) Describe the Conical Scanning method of tracking of an acquired target and how this is an improvement over lobe switching. 10
- (b) Explain working of mono pulse tracking radar for one angle coordinates. 10

**Section-IV**

7. (a) What do you understand by radar receiver and explain different types of radar receivers ? 12
- (b) Discuss noise figure of a receiver and noise figure due to RF losses. 8
- ~~8.~~ (a) Discuss the principle and working of balanced Duplexer. 10
- (b) What are the factors influencing the bandwidth of a radar receiver ? What are the advantages and disadvantages of a very large bandwidth ? 10

$$P_{a-z} \cdot f_p = P_{at}$$