

## Radar Engineering.

Con. 5235-06.

YM-5947

(REVISED COURSE)

(3 Hours)

[ Total Marks : 100

- N.B. (1) Question no. 1 is compulsory.  
 (2) Attempt any **four** questions out of remaining **six** questions.  
 (3) **Figures** to the **right** indicate **full** marks.
1. (a) Explain in brief the various system losses in the radar. 5  
 (b) What do you understand by the term Radar resolutions cell ? 5  
 (c) Explain instrument Landing system in brief. 5  
 (d) Explain DECCA. 5
  2. (a) Derive the Radar range equation, in terms of the Noise figure. 10  
 (b) (i) The receiver of a radar has a noise figure of 6 dB. If the IF-bandwidth  $B$  of the receiver is 3 MHz, calculate the minimum detectable power. 5  
 (ii) If the radar is designed for operation at 10 GHz with an antenna of diameter 2 m, calculate the peak pulse power required to have a maximum range of 1000 km with a target of cross sectional area  $20 \text{ m}^2$ . 5
  3. (a) What do you mean by RCS ? Explain the RCS of following : 10  
       (i) Sphere           (ii) Rod           (iii) Complex target.  
 (b) What do you mean by RCS fluctuations ? Explain different swerlings model for RCS fluctuations. 10
  4. (a) Draw the functional block diagram of an MTI radar system and explain its operation. Define the terms blind speed and MTI improvement factor. 10  
 (b) Derive an expression for doppler frequency shift in terms of transmitted frequency and radial component of target velocity vector. 10
  5. (a) (i) An MTI Radar is operating at 10 GHz with an PRF of 1000 Hz. Calculate the lowest three blind speed. 5  
       (ii) The MTI Radar is used by a traffic control police to measure the speed of cars. If the doppler frequency shift measured from the moving car is 1.6 KHz, calculate the speed of the car. 5  
 (b) What do you understand by the term clutter. Enumerate the properties of sea and Land clutter. 10
  6. (a) With a suitable block diagram explain the working of a conical scan tracking radar. 10  
 (b) Describe briefly the two different types of phased-array radar. State their functions. 10
  7. Write short note on the following :—  
 (a) Loran 5  
 (b) Remote Sensing Radar 5  
 (c) Hyperbolic Navigation 5  
 (d) Four Point Tracking. 5