

**328744(28)**

**B. E. (Seventh Semester) Examination,**  
**April-May 2020 / NOV-DEC 2020**  
**(New Scheme)**

**(Et&T Engg. Branch)**

**RADAR and NAVIGATIONAL AIDS**

***Time Allowed : Three hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note : Attempt all questions. Part (a) of each questions is compulsory. Attempt any two parts from (b), (c) and (d) of each question.***

**Unit-I**

1. (a) Explain the following : 2

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- (i) Blind speed
- (ii) Pulse repetition frequency
  
- (b) Prove that the maximum radar range is directly proportional to one fourth power of Antenna gain. 7
  
- (c) Define threshold detection. What do you mean by probability of detection of false alarm? 7
  
- (d) (i) The receiver of a radar has a noise figure 6 db. If the IF bandwidth  $B$  of the receiver be 3 MHz, then calculate the minimum detectable power.
- (ii) If the Radar is designed for operation at 10 GHz with an antenna of diameter 2 m, calculate the peak power required to have a maximum range of 1000 km with a target of cross sectional area  $20 \text{ m}^2$ . 7

### Unit-II

- 2. (a) Explain the Doppler principle. 2
- (b) Explain the term lobe switching and sequential lobbing. 7
- (c) An MIT radar is operated at 9 GHz with a PRF of 3000 PPS. Calculate the first two blind speeds for this radar. Derive the formula used. 7

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- (d) Draw and explain simple block diagram of MIT RADAR. 7

### Unit-III

- 3. (a) Define Scattering, Refraction and Diffraction in terms of Radar wave. 2
- (b) Discuss the effect of forward scattering from a round earth surface of radar waves. 7
- (c) Explain Environmental Noise in details. 7
- (d) A low power short range radar with a low noise RF amplifier with gives an overall noise figure of 4.77 dB. If a antenna diameter is 1 m, bandwidth is 500 kHz, the operating frequency is 8 GHz with  $5 \text{ m}^2$  cross section area at a maximum distance of 12 km. What must be peak power transmitted? 7

### Unit-IV

- 4. (a) What are the different function of radar Antenna? 2
- (b) Explain the various parameters of Radar antenna. 7
- (c) Explain the significance of cosecant square antenna and any one method of generating cosecant square pattern. 7

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- (d) Explain the super Hetrodyne receiver with the proper block diagram. 7

**Unit-V**

5. (a) What do you mean by the term automatic frequency control in radar receiver? 2
- (b) What do you mean by electronic counter measures and electronic counter-counter measures? Explain in details. 7
- (c) Explain the construction and basic operation of Magnetron. 7
- (d) Explain A-scope and PPI display with reference to radar. What are their limitation? 7