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328744(28)

B. E. (Seventh Semester) Examination, Nov.-Dec. 2015

(New Scheme)

(ET & T Engg. Branch)

RADAR and NAVIGATIONAL AIDS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt part (a) of each question is compulsory and carrying of 2 marks each and attempt two parts from (b), (c) and (d) carrying of 7 marks each.*

Unit-I

1. (a) What is meant by multiple time around echos?

(b) Derive simple form of Radar Range equation. What

are the main reasons for the failure of the simple form of the radar range equation.

(c) A 10 GHz radar has the following characteristics :

Peak transmitted power = 250 kW

Minimum detectable peak signal powers by receiver = 10^{-14}W

Cross sectional area of radar antenna = 10 m^2

Antenna aperture efficiency = 0·9

If this radar were to be used to defect a target of $2m^2$ equivalent radar cross section.

Find the maximum range of radar.

(d) Derive the expression for probability of false alarm.

Unit-II

2. (a) An MTI Radar operates at 10 GHz with a PRF of 1500 PPS. Calculate the first and third blind speed.

(b) What is doppler effect? Derive an expression for relative velocity of a moving target. The MTI Radar is used by traffic control police to measure the speed of cars. If the doppler frequency shift measured from moving car is 1·6 kHz. Calculate the speed of car. Assume Radar is operating at 10 GHz.

(c) What is delay line canceller? Draw the block diagram of single delay line canceller. Sketch the frequency response of single delay line canceller and explain. What are the limitations of single delay line canceller?

(d) With neat diagram explain the operation of sequential lobing.

Unit-III

3. (a) What is elevated duct?

(b) Explain in detail how forward scattering from a flat earth changes radar performance.

(c) Explain the effect of attenuation by atmospheric gases.

(d) What is environmental noise? Explain atmospheric absorption noise, cosmic noise and earth thermal noise.

Unit-IV

4. (a) Define directive gain and power gain of an antenna.

(b) Describe the detail construction and working of parabolic antenna.

(c) Describe in detail about phased array antenna.

(d) What do you mean by Radome? List out the application of radome and explain in brief different type of radome.

Unit-V

5. (a) What is PPI?

(b) Define receiver noise figure. Derive the expression of noise figure of networks in cascade.

(c) What is duplexer and receiver protector? Explain balanced duplexer in detail.

(d) Write short note on ECM and ECCM.