

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, May - 2017

**RADAR SYSTEMS**

(Electronics and Communication Engineering)

Max. Marks: 75

Time: 3 hours

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

(25 Marks)

- 1.a) Describe various radar applications. [2]
- b) Calculate the range of a target, if the time taken by the signal to travel and return is 100 micro seconds? [3]
- c) Calculate the Doppler frequency of an aircraft moving with a speed of 550 Knots and when the CW radar is working with  $\lambda = 8\text{cms}$ . [2]
- d) Write about Doppler principle. [3]
- e) What are the differences between Pulse radar and Pulse Doppler radar? [2]
- f) Write about MTI radar parameters. [3]
- g) Discuss the sequential lobing tracking antenna mechanism. [2]
- h) Briefly explain the tracking radar and search radar system. [3]
- i) Give the comparison between the efficiency of matched and non matched filters. [2]
- j) Discuss in brief measuring of noise figure. [3]

**PART - B**

(50 Marks)

- 2.a) What is minimum detectable signal? Calculate minimum receivable signal in a radar receiver that has an IF bandwidth of 1.5 MHz and a 9-dB noise figure. [5+5]
  - b) Discuss in brief the radar range equation and modified radar range equation. [5+5]
- OR**
- 3.a) Discuss the radar cross section of the targets : Sphere, Flat Plate, Triangular trihedral. [5+5]
  - b) Write about radar system losses.

4. Draw a block diagram of the FMCW radar and explain its operation. [10]

**OR**

5. Discuss the following a) Non-Zero IF receiver b) Isolation between the transmitter and receiver. [10]

- 6.a) Explain MTI radar with a block diagram. [5+5]
- b) Define the terms : Clutter attenuation, Sub-clutter visibility.

**OR**

- 7.a) Discuss the principle of operation of Pulse Doppler Radar. [5+5]
- b) Explain blind speed and the methods for reducing the effects of blind speed.

8. Explain with the help of a block diagram amplitude comparison monopulse radars for extracting error signals in both elevation and azimuth. [10]

**OR**

- 9.a) Define tracking in range and explain the split gate tracker method. [5+5]
- b) Explain the working of a monopulse radar with the help of a block diagram.

- 10.a) What is meant by correlation? Explain cross correlation with the help of neat block diagram.

- b) A radar receiver is connected to a 30 ohm resistance antenna that has an equivalent noise resistance of 25 ohm. Calculate the noise figure of the receiver and the equivalent noise temperature of the receiver. [5+5]

**OR**

- 11.a) Write about radiation pattern of phased array antennas with suitable equations.

- b) Write about: i) beam steering ii) beamwidth of phased array antennas. [5+5]