

Code No: RT41048

**R13**

**Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

**RADAR SYSTEMS**

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B*

*Answer ALL sub questions from Part-A*

*Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) List the applications of radar. [4]
- b) Explain about PRF and range Unambiguous. [4]
- c) What is the need of full wave rectifier in delay line canceller? [4]
- d) Explain the use of hybrid junction in mono pulse tracking radar. [4]
- e) Write the merits of electronically steered phased array antennas. [3]
- f) Define noise figure. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Derive and explain simple radar equation. [8]
- b) Explain about radar-cross section fluctuations. [8]
3. a) What is Doppler effect? Write the applications and limits of CW radar. [8]
- b) Discuss the various unwanted signals which cause errors in FM-CW altimeter. [8]
4. a) Describe the operation of MTI Radar with power amplifier transmitter. [8]
- b) Discuss how error signal is generated from sequential lobing. [8]
5. Write a short note on [16]
  - (a) Acquisition and scanning parameters
  - (b) Radomes
6. a) With suitable expressions explain series-fed, frequency-scan linear array. [8]
- b) Explain about Constant-False-Alarm-Rate receiver. [8]
7. a) What is display? Discuss various types of displays. [8]
- b) With neat sketches explain series versus parallel feeds. [8]



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**Time: 3 hours**

**Max. Marks: 70**

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*Answer ALL sub questions from Part-A*

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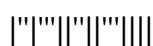
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**PART-A (22 Marks)**

1. a) Define signal to noise ratio. [4]
- b) Mention salient features of FMCW radar. [4]
- c) Write the differences between MTI and pulse Doppler radar. [4]
- d) Distinguish amplitude and phase comparison mono-pulse radar. [4]
- e) Define matched filter. [3]
- f) List the types of radar receivers. [3]

**PART-B (3x16 = 48 Marks)**

2. a) List the types of radars and write their applications. [8]
- b) With the help of expressions explain radar transmitter power. [8]
3. a) Draw and explain block diagram of CW Doppler radar with non zero IF receiver. [8]
- b) With the help of expressions explain multiple frequency CW radar. [8]
4. a) Explain double cancellation staggered PRF with the help of neat diagrams. [8]
- b) Discuss the operation of conical scanning method. [8]
5. a) Describe the operation of amplitude comparison mono pulse radar for single angular coordinate. [8]
- b) Explain radar antenna parameters. [8]
6. a) Write a short note on different types of phase shifters. [8]
- b) Derive the response characteristics of matched filter. [8]
7. a) With suitable expressions explain noise figure of two networks in cascade. [8]
- b) What is phased array antenna? Explain the radiation pattern of phased array antenna. [8]



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**Set No. 3**

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Max. Marks: 70

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*Answer ALL sub questions from Part-A*

*Answer any THREE questions from Part-B*

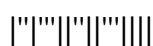
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**PART-A (22 Marks)**

1. a) What is integration of radar pulses? [4]
- b) Determine the acceleration of target having the receiver bandwidth is 70 Hz and operating wavelength is 12cm. [4]
- c) What is blind speed? How it can be avoided? [4]
- d) Mention the types of tracking. [3]
- e) What is CFAR receiver? [4]
- f) What is a beam steering? [3]

**PART-B (3x16 = 48 Marks)**

2. a) Derive modified radar range equation. [8]
- b) Explain the effect of Signal to Noise ratio in radar with suitable expressions. [8]
3. a) Describe the operation of CW Radar with neat diagram. [8]
- b) Explain the range and Doppler measurement of FM-CW radar. [8]
4. a) What is the necessity of Doppler filter banks used in MTI Radar? [8]
- b) Discuss, what are the limits effects the MTI performance. [8]
5. a) Draw and explain the block diagram of two-coordinate amplitude-comparison mono pulse tracking radar. [8]
- b) Design and explain cosecant-squared antenna pattern. [8]
6. a) Write a short note on architecture for phased arrays. [8]
- b) Discuss the relationship between matched filter characteristics and correlation function. [8]
7. a) Explain principle of operation of balanced type Duplexer using TR tubes and two short-slot hybrid junctions. [8]
- b) Write the applications and limitations of phased array antennas. [8]



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Max. Marks: 70

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*Answer ALL sub questions from Part-A*

*Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) What is minimum detectable signal? [3]
- b) Write the equations for collapsing loss. [4]
- c) What is need of delay line canceller? [4]
- d) Write the differences between trackers. [4]
- e) List the types of phase shifters. [4]
- f) Write the merits of Phased array antennas. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Draw and explain simple radar block diagram. [8]
- b) Explain how radar cross section controls the radar performance. [8]
3. a) Discuss the concept of isolation between transmitter and receiver. [8]
- b) Describe the principle of operation of FM-CW radar using sideband super heterodyne receiver. [8]
4. a) Draw and explain MTI Radar with power oscillator transmitter. [8]
- b) Write the differences between MTI versus pulse Doppler radar. [8]
5. a) In mono pulse radar two antennas are used to produce a phase difference of  $30^\circ$  between the echo signals. It operates at frequency of 1.75 GHz. Find the spacing between the antennas if the angle  $\theta = 18^\circ$ . [8]
- b) Draw and explain parabolic-reflector antenna. [8]
6. a) Describe the operation of digitally phase shifters. [8]
- b) With the help of expressions explain Envelop detector. [8]
7. Write a short note on  
(a) Circulator as Duplexers  
(b) Beam steering and Beam width changes [16]

