

Code No: RT41048

R13**Set No. 1****IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017****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*

PART-A (22 Marks)

1. a) Explain the effect of weather on Radar. [3]
b) What are the limitations of power leakage in a Radar transmitter? [3]
c) Explain the butterfly effect. [4]
d) Define antenna beam width and write expression for it. [4]
e) Define the requirements of a matched filter in a radar receiver. [4]
f) Describe the principle of a circulator. [4]

PART-B (3x16 = 48 Marks)

2. a) Explain the need for integration of Radar pulses and define the following terms:
(i) Integration Efficiency [8]
(ii) Integration Improvement Factor [8]
b) A radar system transmits pulses of duration $2 \mu\text{s}$ and repetition rate of 1 KHz. Find the minimum and maximum range for radar. [8]
3. a) Explain Doppler shift and its role in pulsed and CW Radar. [8]
b) Explain the principle of operation of multiple frequency CW radar with suitable diagram. [8]
4. a) Explain how the problem of blind speed in MTI radar can be overcome by use of multiple PRF? Explain. [8]
b) With a suitable block diagram explain the working of a conical scan tracking radar and explain the factors to be considered in determining the optimum squint angle. [8]
5. a) Explain the principle of operation of phase comparison monopulse tracking radar with a block diagram. [8]
b) Explain the principle of cosecant squared antenna and describe the loss in gain of cosecant squared antennas. [8]
6. a) Explain the characteristics of a matched filter receiver with necessary equations. [8]
b) How a threshold level is selected in threshold detection criteria? Explain. [8]
7. a) Define the noise figure and noise temperature of a radar receiver and derive the expressions for it. [8]
b) Explain the various methods for beam steering of a phased array antenna. [8]

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R13**Set No. 2****IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017****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************PART-A (22 Marks)**

1. a) Explain the factors which govern the pulse repetition frequency. [4]
b) What is called a missed detection for radar? [3]
c) Write down the limitations MTI performances. [4]
d) What is meant by tracking in range? [3]
e) Draw the architecture of a phased array antenna. [4]
f) Write the features of a P-scope display in a radar receiver. [4]

PART-B (3x16 = 48 Marks)

2. a) Describe the working of pulse radar with the help of block diagram. [8]
b) A Radar mounted on an automobile is to be used to determine the distance to a vehicle travelling directly in front of it. The radar operates at a frequency of 9375 MHz with a pulse width of 10 ns. The maximum range is to be 500 ft. find
(i) Pulse repetition frequency
(ii) If the antenna dimensions were 1 ft by 1 ft and antenna efficiency were 0.6. What would be the antenna gain in dB? [8]
3. a) Explain the principle of Doppler effect and its application in CW radar. [8]
b) Explain the principle of operation of FM – CW altimeter with suitable diagrams. [8]
4. a) Draw and explain frequency response characteristics of MTI radar using range gates and filters. [8]
b) With a suitable block diagram explain the working of a conical scan tracking radar. [8]
5. a) Draw the block diagram of amplitude comparison monopulse tracking radar for two angular coordinates and explain its operation. [8]
b) Explain the principle of operation of various types of lens antennas. [8]
6. a) What are the various methods for beam steering of a phased array antenna? Explain any one method. [8]
b) Explain the principle and process of correlation detection in a radar system. [8]
7. a) Explain the operation of branch type duplexer in transmission and reception modes with a neat sketch. [8]
b) Compare the series feeds and parallel feeds for a phased array antenna. [8]

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R13**Set No. 3****IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017****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*

PART-A (22 Marks)

1. a) Explain the factors that influence the bandwidth of Radar. [3]
b) What are the main reasons for the failure of the simple form of the radar equation? [4]
c) What are the limitations of single delay line canceller? [3]
d) What is automatic detection and track? [4]
e) Describe the features of automatic detection in a radar receiver. [4]
f) Define signal-to-noise ratio and noise figure of a radar receiver. [4]

PART-B (3x16 = 48 Marks)

2. a) What do you understand by the terms duty cycle and unambiguous range of radar? Explain the technique employed for resolving range ambiguities. [8]
b) Explain the integration of radar pulses with integration improvement factor. How does it affect the radar equation? [8]
3. a) Explain the various system losses in a radar. [8]
b) What are advantages and disadvantages of FM-CW radar over multiple frequency CW radar? Explain. [8]
4. a) An MTI Radar is operating at 10 GHz with a pulse repetition frequency of 1000Hz. Calculate the lowest three blind speeds. [8]
b) Explain the concept of staggered pulse repetition frequency in case of MTI Radar. [8]
5. a) Differentiate between amplitude comparison and phase comparison methods of monopulse tracking. [8]
b) Write notes on various antenna parameters with reference to radar. [8]
6. a) Why phased-array antennas are more suitable for radar application particularly at VHF and UHF frequencies. [8]
b) Explain the relationship between the matched filter and correlation detection in a radar receiver. [8]
7. a) Explain the structures of balanced duplexer during transmission and reception modes. [8]
b) Explain the radiation patterns and feed arrangements for phased array antennas in a radar system. [8]

Code No: **RT41048****R13****Set No. 4****IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017****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*

PART-A (22 Marks)

1. a) Define land and sea clutter. [4]
b) What is called a false alarm for radar? [3]
c) State the methods to reduce blind speeds in MTI Radar. [4]
d) What do you understand by the term four point tracking? [4]
e) Write functions of phase shifters in a phased array antenna. [3]
f) Write the features of PPI display. [4]

PART-B (3x16 = 48 Marks)

2. a) Draw the block diagram of a pulsed Radar and explain the significance of designing IF amplifier as a matched filter. [8]
b) A pulsed radar operating at 10GHz has an antenna with a gain of 28dB and a transmitter power of 2KW. If it is defined to detect a target with a cross section of 12sq.m and the minimum detectable signal is $P_{min} = -90\text{dBm}$. What is the maximum range of the radar? [8]
3. a) What is Doppler effect? Derive the expression for Doppler frequency shift in terms of relative velocity of target with respect to radar. [8]
b) Explain the operation of CW – IF radar with a block diagram. [8]
4. a) Explain the principle of operation of non-coherent MTI Radar with a block diagram. [8]
b) What is a delay-line canceller? Explain its frequency response characteristics with a neat sketch. [8]
5. a) Draw the block diagram of amplitude comparison monopulse tracking radar for single angular coordinate and explain its operation. [8]
b) Explain the principle, advantages and disadvantages of Cassegrain antenna. [8]
6. a) Describe the advantages, applications and limitations of phased array antennas in a radar system. [8]
b) Explain the operation of CFAR. [8]
7. a) Explain the effect of noise in radar receiver's performance? Describe noise figure and noise temperature parameters. [8]
b) Explain the characteristics of A-scope display in a radar receiver. [8]