R09

Time: 3 Hours   Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks
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1.a) Derive the radar range equation in terms of minimum detectable signal.
  b) What is Maximum Unambiguous Range? How is it related with pulse repetition rate?

2.a) Explain in detail about various system losses involved in radar system.
  b) The bandwidth of IF amplifier in a Radar receiver is 1 MHZ. If the threshold to noise ratio is 13 dB, determine the false alarm time.

3.a) With the help of a suitable block diagram, explain the operation of CW radar with non-zero IF in the receiver.
  b) List out the applications of CW radar and explain it.

4.a) Determine the range and Doppler velocity for FMCW radar if the target is approaching the radar. Given the beat frequency f_b(up)=15 KHz and f_b(down) = 25 KHz for the triangular modulation, the modulating frequency is 1 MHz and Doppler frequency shift is 1 KHz.
  b) Discuss about the multiple frequency CW radar.

5.a) Draw and explain frequency response characteristics of a MTI using range gates and filters.
  b) An MTI radar operates at 6 GHz with a PRF of 800 PPS. Calculate the lowest three Blind speeds of this radar.

6.a) Write the differences between Conical Scan and Monopulse Tracking Radar.
  b) Describe the operation of Monopulse tracking radar with its block diagram.

7.a) What is meant by correlation? Explain cross-correlation with the help of neat block diagram.
  b) Derive the expression for frequency response of the matched filter with Non-white noise.

8.a) Explain how beam width of a phased array antenna will vary with steering angle.
  b) What is a duplexer and describe a typical duplexer with a schematic diagram.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, July - 2014
RADAR SYSTEMS
(Common to ECE, ETM)

Time: 3 Hours
Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks
- - -

1.a) Explain the basic principle of radar and discuss about the various parameters which improve the performance of radar.
b) Discuss about the Radar Frequencies and List out the radar Applications.

2.a) In a radar receiver, the mean noise voltage is 80 mV and the IF bandwidth is 1 MHz. If the tolerable false alarm time is 25 minutes, calculate the threshold voltage level. Also calculate the probability of false alarm
b) Bring out the advantage of integration of radar echoes with an Example.

3.a) With the help of a suitable block diagram, explain the operation of a CW radar with non-zero IF in the receiver.
b) Explain about the Doppler Effect and draw the graph representing Doppler frequency as a function of radar frequency and target relative velocity.

4.a) Briefly explain about multiple –frequency CW radar.
b) Draw the block diagram of the FM-CW Radar using sideband super heterodyne receiver.

5.a) Calculate the blind speeds for a radar with the following specifications: wavelength = 0.1m, PRF =200Hz.
b) Compare and contrast the situations with a power amplifier and a power oscillator in the transmitter of an MTI system.

6.a) Explain with the help of block diagram amplitude comparison monopulse radar for extracting error signals in both elevation and azimuth.
b) With neat diagram explain the operation of Conical Scan tracking radar.

7.a) Explain the principle and characteristics of a matched filter. Hence derive the expression for its frequency response function.
b) Briefly explain about the efficiency of non-matched filters.

8.a) Briefly explain the concept of beam steering phased array antennas.
b) Derive the expression for the noise figure of two networks that are in cascade.

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SET-1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
R05   IV B.Tech. I Semester Supplementary Exams, May/June – 2009
RADAR SYSTEMS

(Common to ECE & ETM)

Time: 3 hours   **Max Marks: 80**

Answer any FIVE Questions.
All Questions carries equal marks.

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1 a) Derive the maximum range for a radar system from first principles.
  b) Explain the applications of radar.   [8+8]

2 a) Write explanatory notes on:
    i) Minimum detectable signal
    ii) False alarm
    iii) Missed detection.
  b) Explain the following:
    i) Pulse repetition frequency
    ii) Range ambiguities.   [16]

3 a) For an unambiguous range of 81 nautical miles (1 nautical mile = 1852 m) in a two frequency CW radar . Determine f_2 and Δf when f_1 = 4.2 kHz . Derive the expression to solve his problem.
  b) Explain the operation of CW Doppler radar non zero IF with neat block diagram.   [10+6]

4 a) Explain the principle of operation of FMCW altimeter with suitable diagram.
  b) Explain how the noise signals are limiting the performance of FMCW altimeter.   [10+6]

5 a) Explain the principle of operation of MTI radar with power amplifier transmitter with neat block diagram.
  b) What is butterfly effect? What are its advantages.   [10+6]

6 a) Compare tracking techniques.
  b) Explain the principle of operation of phase comparison monopulse tracking radar.   [10+6]

7 a) What is a matched filter receiver? Draw its response characteristics.
  b) Describe the operation of matched filter with non white noise.   [8+8]

8) Explain the following:
    i) Branch type duplexer
    ii) Balanced type duplexer
    iii) Receiver protectors.   [16]

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SET-2

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
R05   IV B.Tech. I Semester Supplementary Exams, May/June – 2009
RADAR SYSTEMS

(Common to ECE & ETM)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions.
All Questions carries equal marks.

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1 a)   Obtain the radar equation and discuss various parameters which improve the performance of radar
   b)   A pulsed radar operating at 10 GHz has an antenna with a gain of 28dB and a transmitter of 2 KW (pulse power). If it is defined to detect a target with a cross section of 12 sq. m. and the minimum detectable signal is -90 dBm . What is the maximum range of the radar.   [8+8]

2 a)   Explain detection of signals in noise.
   b)   Describe different noise components present in radar systems.   [8+8]

3 a)   Define Doppler effect. Explain how it is used in CW radar
   b)   Explain how isolation between transmitter and receiver is obtained in CW radar.
                                                                            [8+8]

4 a)   Explain the principle of operation of FMCW altimeter with suitable diagram.
   b)   Describe the operation of multiple frequency CW radar.   [10+6]

5 a)   Explain the principle of operation of MTI radar with power oscillator transmitter with neat block diagram.
   b)   Discuss about blind speeds.   [10+6]

6 a)   Explain in detail about the limitations to tracking accuracy.
   b)   Explain the operation of amplitude comparison monopulse tracking radar with the help of a block diagram.   [6+10]

7 a)   Derive the matched filter characteristic.
   b)   Discuss about efficiency of non-matched filters.   [10+6]

8 a)   Write notes on various displays.
   b)   Explain the operation of branch type duplexer with neat sketch.   [10+6]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
R05 IV B.Tech. I Semester Supplementary Exams, May/June – 2009
RADAR SYSTEMS

(Common to ECE & ETM)

Time: 3 hours   **Max Marks: 80**

Answer any FIVE Questions.
All Questions carries equal marks.

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1 a)   Obtain the radar equation and discuss various parameters which improve the performance of radar.
  b)   Draw the simple radar block diagram and explain its operation.   [8+8]

2)   Write explanatory notes on:
     i)   Pulse repetition frequency and range ambiguities
     ii)   System losses.   [6+10]

3 a)   Define Doppler effect. Explain the operation of simple CW radar with block diagram. List its applications.
  b)   Write about the necessity of using filter banks in CW radar receiver.   [10+6]

4 a)   Explain the operation of sinusoidally modulated FMCW radar extracting the third harmonic with neat block diagram.
  b)   Explain the operation of multiple frequency CW radar.   [10+6]

5 a)   Discuss about staggered pulse repetition frequencies.
  b)   Explain the principle of operation of MTI radar using range gates and filters.
                                              [8+8]

6 a)   Compare sequential lobing and conical scanning.
  b)   Explain in detail about limitations to tracking accuracy.   [8+8]

7 a)   Derive the matched filter characteristic.
  b)   Discuss about matched filter and correlation function.   [8+8]

8 a)   Write notes on:
     i)   noise figure
     ii)   noise temperature.
  b)   Explain any two types of mixers.   [16]

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SET-4

(Common to ECE & ETM)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions.
All Questions carries equal marks.

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1 a)   A pulsed radar operating at 10 GHz has an antenna with a gain of 28dB and a transmitter of 2 KW (pulse power). If it is defined to detect a target with a cross section of 12 sq. m. and the minimum detectable signal is -90 dBm . What is the maximum range of the radar.

 b)   Explain about the applications of radar.   [8+8]

2)   Write explanatory notes on:
        i)   Receiver noise
        ii)   Signal to noise ratio
        iii)   Radar cross section of targets.   [16]

3 a)   Explain the principle of operation of CW Doppler radar with non zero IF receiver.

 b)   Explain the mechanism of finding target direction.   [8+8]

4 a)   Explain how range and Doppler measurements are performed using FMCW radar.

 b)   Discuss about measurement errors.   [8+8]

5)   Write notes on the following:
        i)   Delay line cancellers
        ii)   Blind speeds
        iii)   Clutter attenuation
        iv)   Transversal filters.   [16]

6)   Explain the following:
        i)   Low angle tracking
        ii)   Tracking in range
        iii)   Acquisition.   [16]

7 a) Derive the equation for impulse response of a matched filter

  b) Write short notes on
    i) Efficiency of non matched filters.
    ii) Matched filter with non white noise.   [8+8]

8 a) What is low noise front end? What are its applications.

  b) Explain the following:
    i) Balanced type duplexer
    ii) Branch type duplexer.   [8+8]

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