Code No. M0422 **R07** **Set No.1**

IV B.Tech I Semester Supplementary Examinations, February/March, 2012
RADAR SYSTEMS
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. a) Expand Radar? Discuss the applications of radar.
   b) Define maximum unambiguous range?
   c) In the pulse repetition frequency is 10KHZ, calculate the maximum unambiguous range?
   d) Write about the frequencies that are used for Radar communications? [4+4+4+4]

2. Explain about the following:
   a) Minimum detectable signal (S_{min}) [8]
   b) Target cross section s [8]

3. a) Draw the block diagram of a simple CW radar and explain the working of each block? [8]
   b) Discuss the applications of a CW radar. [8]

4. Write short notes on the following:
   a) Range and Doppler measurement of a target using a FM-CW radar. [8]
   b) Unwanted signals and the measurement errors in FM altimeter. [8]

5. a) Draw the block diagram of a delay line filter which produces a 3-pole Chebyshev low pass filter characteristic with 0.5db ripple in the passband? [8]
   b) Write about the following:
   i)Blind speeds
   ii) staggered prf. [8]

6. a) Explain how tracking is achieved using radar? [4]
   b) Write about phase-comparison monopulse radar? [4]
   c) Describe the phase comparision monopulse tracking technique in a radar system with the help of necessary block diagram. [8]

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7. a) Draw the block diagram of a correlation receiver and explain its operation with necessary equations. [10]
   b) Derive the transfer function for matched filter? [6]

8. a) Write a short notes on [8]
      i) Noise figure
      ii) Noise temperature
   b) A radar receiver is connected to a 50 ohms resistance antenna that has an equivalent noise resistance of 30 ohms. Calculate the noise figure of the receiver and the equivalent noise temperature of the receiver. [8]

Code No. M0422 **R07** **Set No.2**

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RADAR SYSTEMS
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
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*****

1. a) Draw the functional block diagram of simple pulse radar and explain the purpose and functioning of each block in it. [8]
   b) List major applications of radar in civil and military systems. [8]

2. a) Discuss the effect of noise on the radar receiver sensitivity? [8]
   b) Write about the following:
      i). Beam-shape loss
      ii). collapsing loss. [8]

3. What are the different methods that provide isolation between transmitter and receiver? [16]

4. a) With the help of suitable block diagram, explain the operation of a FM-CW altimeter. [8]
   b) Discuss all the possible errors in the measurement accuracy of altitudes using a FM-CW radar. [8]

5. a) Draw the block diagram of MTI radar and explain its operation? [8]
   b) What is the necessity for a delay line canceller? Compare the performance of double delay line canceller with single delay line canceller? [8]

6. a) Explain the following.
      i) Low angle tracking
      ii) Tracking in range
      iii) Acquisition [8]
   b) Draw the block diagram of amplitude comparison monopulse radar. And explain. [8]

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7. a) Explain the equivalence between matched filter and correlator? [8]
   b) Discuss about the performance of matched filter with non white noise? [8]

8. a) Write a short notes on
      i) Noise figure
      ii) Noise temperature [8]
   b) Write about CRT screens for display in radar systems. [8]

Code No. M0422 **R07** **Set No.3**

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RADAR SYSTEMS
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
*****

1. Derive the simple form of the radar equation? And explain the significance of each term in that equation? [16]

2. a) Derive the equation for minimum detectable signal Smin in terms of output signal to noise ratio? [8]
   b) Discuss the effect of pulse repetition frequency on the receiver? [8]

3. a) Explain about the Doppler effect? [8]
   b) What are effects of receiver bandwidth in CW radar? [8]

4. a) Write necessary equations to measure range and Doppler frequency in FM-CW radar? [8]
   b) Compare FM-CW radar with pulse radar? [8]

5. a) Explain about range gated Doppler filters? [8]
   b) Compare the performance of MTI with pulse Doppler radar? [8]

6. a) With the help of a suitable block diagram, explain sequential lobing type of tracking technique in a tracking radar system. [8]
   b) Compare and contrast conical scan and sequential lobing type tracking techniques. [4]
   c) Describe the process of acquiring a moving target prior to tracking it along with the patterns used for acquisition. [4]

7. a) Derive the equation for impulse response of a matched filter. [8]
   b) Write short notes on
      i) Efficiency of non-matched filters.
      ii) Matched filter with non-white noise. [8]

8. a) Explain the effect of noise figure on the radar receiver? [8]
   b) Write the principle of branch type duplexer? [8]

Code No. M0422 **R07** **Set No.4**

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RADAR SYSTEMS
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
*****

1. a) What are the applications of radar? [8]
   b) Write the radar equation and explain the factors on which it depends? [8]

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

3. a) Draw the block diagram of IF Doppler filter bank? Draw its frequency response characteristics? [8]
   b) Calculate Doppler frequency shift (f_d) when the relative velocity of target with respect to radar is 50 knots at a transmitted frequency of 80MHZ. [8]

4. a) What are the major drawbacks of a simple CW radar? [8]
   b) Write about multiple frequency CW radar? [8]

5. a) What is a delay line canceller? Illustrate the concept of blind speeds based on the frequency response of a single delay line canceller. [8]
   b) Discuss the factors limiting the performance of an MTI system. [8]

6. a) Describe sequential lobing type of error signal generation to track a target automatically. [8]
   b) Compare the four continuous tracking radar techniques? [8]

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. a) Explain the following. [8]
      i) Balanced type duplexer
      ii) Branch type duplexer
   b) Write notes on various types of displays that are used for monitoring radar. [8]