Code No: RR420402 **Set No. 1**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
RADAR ENGINEERING
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the maximum range for a Radar system, from first principles.
   (b) A pulsed Radar operating at 10 GHz has an antenna with a gain of 28 dB and a transmitter power of 2kW (Pulse power). If it is defined to detect a target with a cross section of 12 sq.m. and the minimum detectable signal is P_{min}=-90 dBm. What is the maximum range of the Radar? [8+8]
2. (a) What do you understand by false alarm? What are the design precautions to be taken to minimize it?
   (b) Describe the different noise components present in Radar systems. [8+8]
3. (a) Explain the principle of operation FMCW Altimeter with suitable diagram.
   (b) An 8GHz police Radar measures a Doppler frequency of 1788Hz from a Car approaching the stationary police vehicle in an 80km/h speed limit zone. What should the police officer do? [10+6]
4. (a) Explain the effect of Doppler frequency "fd" for the stationary objects and moving targets.
   (b) Explain the Butterfly effect that is produced by MTI. [6+10]
5. Explain the following limitations of MTI radar.
   (a) Equipment instabilities.
   (b) Scanning modulation.
   (c) Internal fluctuation of clutter. [5+5+6]
6. (a) Compare the tracking techniques.
   (b) Explain in detail about limitations to tracking accuracy. [10+6]
7. (a) List out the different types of displays used for radar applications, and their characteristics.
   (b) Three network units, each of 6 dB noise figure and 10 dB, 6 dB and 3 dB gains respectively are cascaded. Determine the overall noise figure of the system. [8+8]
8. (a) Explain the characteristics of a cross-correlation receiver with a block diagram.
   (b) Describe and differentiate between active ECM and passive ECM. [8+8]

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Code No: RR420402 **Set No. 2**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
RADAR ENGINEERING
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the basic Radar equation.
   (b) What are the problems and limitations in the prediction of radar range.
   (c) Discuss about detection of signals in noice. [6+5+5]
2. (a) What is meant by minimum detectable signal in Radar? Discuss the effect of integration of Radar pulses.
   (b) Discuss the factors affecting the PRF and range of a Radar. [10+6]
3. (a) Explain the operation of side band superheterodyne type CW Doppler Radar with block diagram.
   (b) Explain how the noise signals are limiting the performance of FM altimeter. [8+8]
4. (a) Draw and explain frequency-response characteristics of an MTI using range gates and filters.
   (b) What is the difference between MTI radar using range gates and an MTI with a single-delay-line canceler. [8+8]
5. Explain the following limitations of MTI radar.
   (a) Equipment instabilities.
   (b) Scanning modulation.
   (c) Internal fluctuation of clutter. [5+5+6]
6. (a) Compare the tracking techniques.
   (b) Explain in detail about limitations to tracking accuracy. [10+6]
7. (a) Explain various types of radar displays.
   (b) Write notes on feed illumination angle, feed support, and f/d ratio with reference to radar antennas. [8+8]
8. (a) Explain the characteristics of a matched filter receiver, with necessary equations.
   (b) Write notes on: Noise jamming, Repeater jamming. [8+8]

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Code No: RR420402 **Set No. 3**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
RADAR ENGINEERING
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe a pulsed Radar system. Discuss how the direction and range of an object is determined using this system.
   (b) Discuss about the frequencies used for radar. [10+6]
2. (a) What do you understand by false alarm? What are the design precautions to be taken to minimize it?
   (b) Describe the different noise components present in Radar systems. [8+8]
3. (a) Explain the principle and applications of CW Doppler Radar.
   (b) Estimate the Range of a FMCW Radar, if its frequency is modulated at a rate fm over a range Δf. Derive the expression used, hence calculate its range, if Δf=1.6KHz, fm=100KHz and Beat frequency is 30Hz. [7+9]
4. (a) Draw and explain frequency-response characteristics of an MTI using range gates and filters.
   (b) What is the difference between MTI radar using range gates and an MTI with a single-delay-line canceler. [8+8]
5. (a) Mention the limitations of MTI radar related to clutter parameters.
   (b) Mention the limitations of improvement factor imposed by pulse-to-pulse instability.
   (c) Write short notes on inter clutter visibility. [6+5+5]
6. (a) How is radar target acquired in a typical radar?
   (b) What factors determine the range and angular accuracies in a radar? [8+8]
7. (a) Define the noise figure for a radar receiver, and obtain an expression for the noise figure for 3 networks in cascade.
   (b) Explain the functioning and characteristics of PPI display. [10+6]
8. (a) Explain the characteristics of a matched filter receiver, with necessary equations.
   (b) Write notes on: Noise jamming, Repeater jamming. [8+8]

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Code No: RR420402 **Set No. 4**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
RADAR ENGINEERING
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw the block diagram of a pulsed radar and explain it's operation.
   (b) What are the desirable pulse characteristics and the factors that govern them in a Radar system? [10+6]
2. By applying Statistical noise theory, derive the Signal to Noise Ratio and hence the expression for probability of detection. [16]
3. (a) Explain the operation of CW tracker illuminator of the missile system.
   (b) What are the advantages and disadvantages of FMCW Radar over multiple frequency CW Radar. [8+8]
4. (a) What is the principle of MTI Radar?
   (b) How does a MTI Radar differ from CW Radar.
   (c) What is the distinctive feature that makes the MTI Radar and pulse Doppler Radar to differ? [5+5+6]
5. (a) Differentiate the operation of pulse radar from simple cw radar.
   (b) Draw the output waveforms from mixer for the different range of Doppler frequency.
   (c) Draw the different sweeps of an MTI radar on A-scope display. [6+5+5]
6. (a) Compare the tracking techniques.
   (b) Explain in detail about limitations to tracking accuracy. [10+6]
7. (a) List out the different types of displays used for radar applications, and their characteristics.
   (b) Three network units, each of 6 dB noise figure and 10 dB, 6 dB and 3 dB gains respectively are cascaded. Determine the overall noise figure of the system.

   [8+8]
8. (a) Establish the impulse response characteristic for a matched filter.
   (b) Derive the radar range expression in terms of jammer bandwidth and power.

   [8+8]

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