Code No: 07A80401   **R07**   **Set No. 2**

IV B.Tech II Semester Examinations,April/May 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) Explain how the noise is limiting the Radar receiver sensitivity?

   (b) What are the collapsing losses? Give the mathematical equation for it, and explain each parameter. [8+8]

2. (a) What is meant by multiple- time-around echoes? When they are obtained.

   (b) What types of modulations are used in Radar? Compare them.

   (c) What are the various applications of Radar. [6+4+6]

3. (a) Write the short notes on matched filter.

   (b) Write the short notes on nonmatched filter. [8+8]

4. (a) Derive the expression for the relative velocity of a target with respect to radar from Doppler frequency.

   (b) Explain how the Doppler direction is measured using synchronous two phase modulator? [6+10]

5. (a) Discuss about the internal fluctuation of clutter which limits the performance of MTI Radar.

   (b) Describe briefly the analog MTI systems. [8+8]

6. (a) Explain the block diagram of amplitude comparison mono pulse for extracting error signals in both elevation and azimuth.

   (b) With diagrams explain Split-range-gate tracking. [8+8]

7. (a) Explain how a multiple frequency CW radar technique is used for the accurate measurement of distance in surveying and in missile guidance?

   (b) What is FM altimeter? Explain how it works and what are the applications of it? [8+8]

8. (a) Discuss Radar CRT phosphor characteristics.

   (b) Explain about Color CRTs. [8+8]

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Code No: 07A80401   **R07**   **Set No. 4**

IV B.Tech II Semester Examinations,April/May 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) With block diagram explain MTI radar using range gated doppler filters.

   (b) Differentiate blind phases from blind speeds.   [10+6]

2. (a) Describe the conical scanning method.

   (b) Explain how AGC is achieved in conical scan tracking Radar receiver.   [8+8]

3. (a) What is a Radar? How it is used in communications?

   (b) Derive the equation for maximum Radar range in terms of radar and target parameters.   [8+8]

4. (a) What are the various unwanted signals which cause errors in FM altimeter?

   (b) Explain the two frequency CW technique for measuring the Radar range.
        [8+8]

5. (a) A low power, short range radar is solid-state throughout, including a low-noise RF amplifier which gives it an overall noise figure of 4.77dB. If the antenna diameter is 1m, the IF bandwidth is 500kHz, the operating frequency is 8 GHz and the radar set is supposed to be capable of detecting targets of $5m^2$ cross sectional area at a maximum distance of 12 km, what must be the peak transmitted pulse power?

   (b) The average false alarm time is a more significant parameter than the false-alarm probability. Give the reasons.

   (c) Why post detection integration is not as efficient as pre-detection integration of radar pulses?   [8+4+4]

6. (a) Draw the block diagram and explain the operation of a CW Doppler radar using an intermediate frequency in the receiver. How have the drawbacks of the basic CW radar been overcome?

   (b) With a (CW) transmit frequency of 5 GHz, calculate the Doppler frequency seen by a stationary radar when the target radial velocity is 100km/h(62.5mph).
        [8+8]

7. Explain the principle and characteristics of a matched filter hence derive the expression for frequency response function.   [16]

8. Why might a double-conversion super heterodyne receiver be used instead of a single-conversion receiver. What limitation might there be in using double-conversion receiver?   [16]

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Code No: 07A80401

$\boxed{\textbf{R07}}$

$\boxed{\textbf{Set No. 4}}$

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Code No: 07A80401 | **R07** | **Set No. 1**

IV B.Tech II Semester Examinations,April/May 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) What is transmitter clutter? How it affects the detection of targets?

   (b) Draw the block diagram of CW Doppler radar with nonzero IF receiver and explain each block. [8+8]

2. (a) Explain the basic principle of elementary form of Radar.

   (b) Explain how the power received by the radar is related to the radar cross-section? Explain the significance of each term. [8+8]

3. Explain in detail about Efficiency of non-matched filters compared with the matched filter. [16]

4. (a) What is the chief advantage of automatic detection and tracking?

   (b) What are its limitations? Explain. [8+8]

5. (a) What is the method of overcoming the problems of blind speed in analog radars?

   (b) What is the need of delay line canceller? Explain three pulse canceller. [8+8]

6. (a) Calculate the maximum range of a radar system which operates at 3 cm with a peak pulse power of 500 kW, if its minimum receivable power is 10^{-13} W, the capture area of its antenna is 5 m^2, and the radar cross-sectional area of the target is 20 m^2.

   (b) Define integration efficiency of Radar pulses.

   (c) What is the false alarm number? How to calculate it? [6+4+6]

7. Explain in detail about N-element linear array and derive its Radiation pattern expression. [16]

8. (a) Why the step error and quantization errors which occur in cycle counter are used for frequency measurement in FMCW Radar.

   (b) Draw the block diagram of sinusoidally modulated FMCW radar and explain the function of each block. [8+8]

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Code No: 07A80401   **R07**   **Set No. 3**

IV B.Tech II Semester Examinations,April/May 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) Discuss about efficiency of nonmatched filters.

   (b) Discuss about Matched filter with nonwhite noise.   [8+8]

2. Explain in detail about different types of phased array radars and list out their advantages and disadvantages.   [16]

3. (a) Explain phase comparison mono pulse tracking radar.

   (b) Discuss in detail about the Angle fluctuations.   [8+8]

4. (a) Explain how earphones are used as an indicator in CW Radar?

   (b) The transmitter power is 1 KW and safe value of power which might be applied to a receiver is 10mW. Find the isolation between transmitter and receiver in dB. Suggest the appropriate isolator.   [6+10]

5. (a) Discuss about the factors that influence the prediction of Radar range.

   (b) Define noise bandwidth of a radar receiver. How does it differ from 3-dB band width? Obtain the expression for minimum detectable signal in terms of noise bandwidth, noise figure and other relevant parameters.   [8+8]

6. (a) What is the beat frequency? How it is used in FMCW radar?

   (b) Explain how the multipath signals produce error in FM altimeter?   [8+8]

7. (a) Explain how the bipolar video signal is converted in to unipolar signal in MTI radar that uses range gates and filters.

   (b) Derive an expression for blind speeds of MTI radar. Discuss the effect of large wavelength and large PRF on lowest blind speed of target.   [8+8]

8. (a) Write the simplifier version of radar range equation and explain how this equation does not adequately describe the performance of practical radar?

   (b) What are the specific bands assigned by the ITU for the Radar? What the corresponding frequencies?   [8+8]

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