

Code No: 07A80401

R07**Set No. 2**

IV B.Tech II Semester Examinations, APRIL 2011

RADAR SYSTEMS

Electronics And Communication Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

1. (a) Draw the block diagram of IF Doppler bank and explain the operation of it with the help of frequency response of it.
(b) What are the effects which limit the amount of transmitter leakage power which can be tolerated at the receiver? [8+8]
2. (a) Explain the basic concept of phased array antennas.
(b) Explain characteristics of different radar displays. [8+8]
3. Discuss in detail about Matched-filter Receiver with necessary expressions. [16]
4. (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]
5. (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]
6. Why is amplitude comparison mono pulse more likely to be preferred over the phase comparison mono pulse and conical scan tracker over sequential lobbing, or lobe switching, tracker? Explain. [16]
7. Explain the following limitations of MTI radar.
(a) Equipment instabilities.
(b) Scanning modulation.
(c) Internal fluctuation of clutter. [16]
8. (a) Write the simplified 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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1. (a) Explain the functioning and characteristics of PPI display and A-Scope.
(b) Explain the terms Linear Array, Planar array, Broadside array and endfire array. [8+8]
2. (a) Explain the function of time domain filter with an example.
(b) An MTI radar operates at 10GHz with a PRF of 300 pps. Calculate the lowest blind speed? [8+8]
3. (a) Explain how the Radar is used to measure the range of a target?
(b) Draw the block diagram of the pulse radar and explain the function of each block. [8+8]
4. (a) Discuss in detail about the Amplitude fluctuations and how its effects are minimized.
(b) Explain Mono pulse tracking in two angle coordinates. [8+8]
5. (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]
6. (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]
7. Derive the impulse response of a matched filter that is commonly used in a radar receiver. [16]
8. (a) Why the step error and quantization errors which occur in cycle counter are used for frequency measurement in FMCW Radar?

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

FIRSTRANKER

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R07**Set No. 1**

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Electronics And Communication Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions

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1. Explain the principle and process of binary moving window detector. [16]
2. (a) Explain how the Radar is used to measure the direction and position of target?
(b) What are the peak power and duty cycle of a radar whose average transmitter power is 200W, pulse width of $1\mu s$ and a pulse repetition frequency of 1000Hz? [8+8]
3. (a) Draw and explain block diagram of Conical-scan tracking radar.
(b) Why does a tracking radar have poor accuracy at low elevation angles? Explain. [8+8]
4. (a) Explain how a threshold level is selected in threshold detection?
(b) How to find the number of pulses that returned from a point target as the radar antenna scans through its beam width?
(c) Why most of the radar receivers are considered as envelop detectors while calculating the SNR? [6+4+6]
5. (a) Draw the structures of balanced duplexer during transmission and reception modes.
(b) List out the merits and demerits of phased array antennas. [8+8]
6. (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]
7. (a) What is the Doppler effect? What are some of the ways in which it manifests itself? What are its radar applications?
(b) Find the relation between bandwidth and the acceleration of the target with respect to radar? [8+8]
8. (a) An MTI radar is operated at 9GHz with a PRF of 3000 pps. Calculate the first two lowest blind speeds for this radar. Derive the formula used.
(b) Discuss the liminations of non-coherent MTI Radar systems. [12+4]

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R07**Set No. 3**

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1. (a) Write the description of Range gate Doppler filters.
(b) Explain the operation of MTI radar with 2 pulse repetition frequencies. [8+8]
2. (a) How to find the target speed from Doppler frequency?
(b) Write the applications of CW Radar.
(c) What are the factors that limit the amount of isolation between Transmitter and Receiver of CW Radar? [4+6+6]
3. (a) Draw and explain the radiation pattern of phased array antennas.
(b) Write notes on various antenna parameters with reference to radar. [8+8]
4. Discuss the relation between the matched filter characteristics and correlation detection. [16]
5. (a) Explain the operation of the two frequency CW Radar.
(b) How to select the difference between two transmitted signals of CW radar? [8+8]
6. (a) Obtain the SNR at the output of IF amplifier of Radar Receiver for a specified probability of detection without exceeding a specified probability of false alarm.
(b) Explain how system losses will affect on the Radar Range? [8+8]
7. (a) What are the different range of frequencies that a radar can operate and give their applications?
(b) What are the basic functions of radar? In indicating the position of a target, what is the difference between azimuth and elevation? [8+8]
8. (a) Draw and explain the following with respect to Tracking in range:
 - i. Echo pulse
 - ii. Early-late range gates
 - iii. Difference signal between early and late range gates.
 (b) Limitation of automatic detection and tracking. [8+8]
