Code No: **R204104G** **R20** **Set No. 1**

IV B.Tech I Semester Regular Examinations, January – 2023

RADAR ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1	a)	Explain the function of receiver noise?	[7]
	b)	Explain the need and function of integration?	[7]
		(OR)	
2	a)	Write short notes on: i) SNR ii) Creeping wave	[7]
	b)	Explain about radio frequencies and their applications.	[7]

UNIT - II

3	a)	With suitable diagrams, explain the constructional difference of CW radar and simple pulse Doppler radar?	[7]
	b)	Write the merits and demerits of continuous wave radar.	[7]
		(OR)	
4		Draw a block diagram of the FMCW radar and explain its operation.	[14]

UNIT - III

5	a)	Explain the operation of MTI Radar with power amplifier transmitter with the help of a neat diagram.	[7]
	b)	Explain MTI radar with a block diagram.	[7]
		(OR)	
6	a)	Compare power amplifier transmitter and power oscillator transmitter.	[7]
	b)	Write short notes on Nth Cancellation Staggered PRFs.	[7]

UNIT - IV

7		Explain the working of each block in mono pulse two-angle co-ordinate system?	[14]
		(OR)	
8	a)	Compare acquisition and scanning pattern.	[7]
	b)	Define tracking in range and explain the split gate tracker method.	[7]

UNIT - V

9	a)	What components are used as radiators in phased arrays?	[7]
	b)	Differentiate Series and Parallel feeds.	[7]
		(OR)	
10	a)	Write short notes on constant false alarm rate receiver?	[7]
	b)	What is meant by correlation? Explain cross correlation with the help of neat block diagram.	[7]

Code No: **R204104G** **R20** **Set No. 2**

IV B.Tech I Semester Regular Examinations, January – 2023

RADAR ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1 a) What is minimum detectable signal? Calculate minimum receivable signal in a radar receiver that has an IF bandwidth of 1.9MHz and a 9-dB noise figure. [7]

b) Write short notes on: i) PRF ii) Transmitted power [7]

(OR)

2 a) Explain the effect of noise on detection of signals? [7]

b) Explain the need for integration of Radar pulses and define the following terms:
i) Integration Efficiency ii) Integration Improvement Factor [7]

UNIT - II

3 a) Explain Doppler shift and its role in pulsed and CW Radar. [7]

b) Describe the principle of operation of FM-CW radar using sideband super heterodyne receiver. [7]

(OR)

4 a) Explain the principle, advantages and applications of multiple frequency CW radar. [7]

b) Explain the range and Doppler measurement of FM-CW radar. [7]

UNIT - III

5 a) Explain the function of pulse Doppler radar and how it is different from simple pulse radar? [7]

b) Write short notes on Range Gated Doppler Filters. [7]

(OR)

6 a) Explain the operation of MTI Radar with power oscillator transmitter with the help of a neat diagram. [7]

b) Explain about different MTI Radar Parameters. [7]

UNIT - IV

7 Explain with the help of block diagram amplitude comparison mono pulse radars for extracting error signals in both elevation and azimuth. [14]

(OR)

8 a) Explain the principle operation and advantages of sequential lobing tracking radar. [7]

b) Write notes on frequency scan arrays? [7]

UNIT - V

9 a) What are the advantages and limitations of series and parallel feeds? [7]

b) Derive the effective noise temperature of N-antenna system? [7]

(OR)

10 Write a short note on i) Derivation of matched filter characteristic.
ii) Efficiency of non- matched filters [14]

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Code No: **R204104G** **R20** **Set No. 3**

IV B.Tech I Semester Regular Examinations, January – 2023

RADAR ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1 Radar mounted on an automobile is to be used to determine the distance to a vehicle travelling directly in front of it. The radar operates at a frequency of 9375MHz with a pulse width of 10ns. The maximum range is to be 500ft. Find (i) Pulse repetition frequency (ii) If the antenna dimensions were 1ft by 1ft and antenna efficiency were 0.6. What would be the antenna gain in dB? [14]

(OR)

2 a) Discuss in brief the radar range equation and modified radar range equation. [7]
b) A radar system transmits pulses of duration 2μs and repetition rate of 1kHz. Find the minimum and maximum range for radar. [7]

UNIT - II

3 a) How FMCW technique is required in radar system? Explain, how can identify the target direction (front or fro)? [7]
b) What are the applications of CW Radar long with frequencies? [7]

(OR)

4 Explain the function of i) FM-CW altimeter ii) Multiple frequency CW radar [14]

UNIT - III

5 a) Draw and explain frequency response characteristics of MTI radar using range gates and filters. [7]
b) Explain how the problem of blind speed in MTI radar can be overcome by use of multiple PRF? Explain. [7]

(OR)

6 a) What are the limitations to MTI performance? [7]
b) Explain the function and necessity of non coherent MTI radar? [7]

UNIT - IV

7 Explain with the help of block diagram, phase comparison mono pulse radars for extracting error signals in both elevation and azimuth. [14]

(OR)

8 a) Explain the constructional details of constrained feed in planar array for scanning in one and two dimensional? [7]
b) Explain the working of mono pulse radar with the help of a block diagram. [7]

UNIT - V

9 a) Design a duplexer with a circulator? [7]
b) Explain the working principle of Branch –type duplexer? [7]

(OR)

10 a) Briefly explain types of displays? [7]
b) Write about radiation pattern of phased array antennas with suitable equations. [7]

Code No: **R204104G** **R20** **Set No. 4**

IV B.Tech I Semester Regular Examinations, January – 2023

RADAR ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1	a)	Explain the function of simple radar system?	[7]
	b)	Discuss the radar cross section of the targets: Sphere, Flat Plate, cone sphere.	[7]
		(OR)	
2	a)	Derive an equation of probability of false alarm?	[7]
	b)	Write about radar system losses.	[7]

UNIT - II

3		Write a short note on: a) Non-Zero IF receiver b) Isolation between the transmitter and receiver.	[14]
		(OR)	
4	a)	Draw the diagram of wanted and unwanted signals in FM altimeter? Explain?	[7]
	b)	What are advantages and disadvantages of FM-CW radar over multiple frequency CW radar? Explain.	[7]

UNIT - III

5	a)	What is a delay-line canceller? Explain its frequency response characteristics with a neat sketch.	[7]
	b)	Discuss the principle of operation of Pulse Doppler Radar.	[7]
		(OR)	
6	a)	Compare MTI versus Pulse Doppler Radar.	[7]
	b)	What is the highest frequency that radar can be operated if it is required it have a maximum unambiguous range of 200nmi and no blind speeds less than 600 kt?	[7]

UNIT - IV

7	a)	Write short notes on comparison of trackers.	[7]
	b)	With a suitable block diagram explain the working of a conical scan tracking radar and explain the factors to be considered in determining the optimum squint angle.	[7]
		(OR)	
8	a)	Explain about tracking with Radar.	[7]
	b)	Write short notes on acquisition patterns.	[7]

UNIT - V

9	a)	Define insertion loss? How much the insertion loss is present in series feed and corporate feed system?	[7]
	b)	Explain the working principle of Balanced type Duplexer?	[7]
		(OR)	
10	a)	What is a radome? What are the applications with radome? Explain.	[7]
	b)	Write about: i) Beam steering ii) Beam width of phased array antennas.	[7]