VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
NAMBURU (AUTONOMOUS)

YEAR/SEM : IV – B.Tech - I-Sem	**NAME OF THE EXAM :** MID – I
SUBJECT : Radar Systems	**SUBJECT CODE :** R1641041
BRANCH : ECE	**DATE :** 22-11-2021

ANSWER ALL QUESTIONS

Set:1

Time : 90 Minutes   **Max. Marks :** 30

			CO	BL	PO	XM
1.	**a.**	Derive the simple form of radar equation.	1	1	1	5
	b.	Discuss in detail about receiver noise and SNR as applicable to radars. Obtain the modified form of range equation.	1	2	1	5
2.	**a.**	With CW transmitter of frequency 5 GHz, calculate the Doppler frequency seen by stationary radar when a target radial velocity is 100 Km/hr.	2	3	1	5
	b.	Explain the principle of FM-CW radar with relevant waveforms.	2	2	1	5
3.	**a.**	Explain the operation of MTI radar with power amplifier transmitter block diagram.	3	2	1	5
	b.	What is a delay line canceler? Obtain the frequency response of single delay line canceler and explain.	3	1	1	5

		VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY NAMBURU (AUTONOMOUS)	
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ANSWER ALL QUESTIONS

Set:2

Time : 90 Minutes   **Max. Marks :** 30

			CO	BL	PO	XM
1.	**a.**	Draw the block diagram of basic radar system and explain the function of each block in detail.	1	1	1	5
	b.	Consider an L-band radar with the following specifications: Operating frequency = 1000 MHz, BW = 3 MHz and Gain = 5000. Compute peak power, pulse width and minimum detectable signal for radar. Assume target RCS = $10m^2$, single pulse SNR = 15.4 dB, noise figure = 6 dB, noise temperature = 290 K, and maximum range = 200 KM	1	3	1	5
2.	**a.**	Explain the operation of nonzero IF receiver with a neat block diagram	2	2	1	5
	b.	Determine the range and Doppler velocity of the target if target is moving away from FM-CW radar. The beat frequency observed for triangular modulation is f_{bu} = 50 KHz and f_{bd} = 20 KHz. Modulation frequency = 2MHz and Doppler shift = 2 KHz.	2	3	1	5
3.	**a.**	What are blind speeds? Obtain an expression for n^{th} blind speed and 1st blind speed.	3	1	1	5
	b.	Calculate the lowest blind speed of an MTI system operating at 3.6cm wavelength and transmitting at a pulse repetition time of 330µs.	3	3	1	5

ANSWER ALL QUESTIONS

Set:3

Time : 90 Minutes   **Max. Marks :** 30

			CO	BL	PO	XM
1.	**a.**	Explain various applications of radar.	1	2	1	5
	b.	What are the various system losses in a radar. Explain in detail.	1	1	1	5
2.	**a.**	Explain how isolation is provided between the transmitter and receiver of CW radar.	2	2	1	5
	b.	Evaluate the relation between Doppler frequency and relative radial velocity of a moving target in CW radar.	2	5	1	5
3.	**a.**	Explain the concept of multiple or staggered PRFs in MTI radar.	3	2	1	5
	b.	Discuss the factors that limit the performance of MTI system.	3	2	1	5