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| BLACK_VVIT ORGINAL LOGO.jpg | **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

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|  | | | **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   1. 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 |

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***ANSWER ALL QUESTIONS***

Set:2

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

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|  | | | **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 = 10m2, 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 fbu = 50 KHz and fbd = 20 KHz. Modulation frequency = 2MHz and Doppler shift = 2 KHz. | 2 | 3 | 1 | 5 |
| **3.** | **a.** | 1. W What are blind speeds? Obtain an expression for nth blind speed and 2. Fi first 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 |

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***ANSWER ALL QUESTIONS***

**Set:3**

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

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|  | | | **CO** | **BL** | **PO** | **XM** |
| **1.** | **a.** | Explain various applications of radar. | 1 | 2 | 1 | 5 |
| **b.** | W What are the various system losses in a radar. Explain in  dedetail. | 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.** | 1. 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 |