MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent institution of MAHE, Manipal)

II SEMESTER, M. TECH (DEFENCE TECHNOLOGY)
END SEMESTER EXAMINATION JULY 2022
COURSE: TACTICAL BATTLEFIELD COMMUNICATION AND ELECTRONIC WARFARE (AAE 5283)

Duration: 3 Hrs **Date: 18/07/2022** **MAX. MARKS: 50**

Note:

- *All questions are compulsory*
- *Draw a neat diagram wherever necessary*
- *Stepwise answers carry marks*

Q1A. Name the quantities that an EW microwave receiver measures. **[2]**

Q1B. Explain Principal and working of a wide band Superhetrodyne receiver with schematic block diagram. **[3]**

Q1C. What is an LPI radar. If a Radar can detect a given target at range R=120 nmi by emitting a peak power of 6 kilowatts. How much power the radar needs to radiate to detect the same target at 9 nmi. **[5]**

Q2A. Define Noise Figure. If there are *N* amplifiers connected in cascade, what would be the formula for the noise figure of the cascade of amplifier? **[2]**

Q2B. What are different ways/method of measuring Angle of Arrival (AoA)/Direction of Arrival (DoA) of a signal in ESM system. Briefly explain any AoA measurement Method with suitable Schematic diagram. **[3]**

Q2C. In what different ways Electronic Counter Measures (ECM)/Electronic Attack (EA) can be Implemented (i.e. Jamming can be classified). What is J/S ratio, give suitable Equation to calculate it. What is Burn through Range of a jammer? **[5]**

Q3A. Write win brief about the Neyman Pearson Lemma used during detection in Radar and EW receivers. **[2]**

Q3B. What is an antenna? Define polarisation of an antenna. What are the different types of polarisation? What type of antenna is used for receiving signals from all directions; for jamming applications? **[3]**

Q3C. List down and elaborate the common issues faced in communication links in the UAV communication as well as in cell phones. **[5]**

Q4A. What are different methods that one can adopt to reduce the noise floor of a communication system? **[2]**

Q4B. What is Radar finger printing and how does it help in the electronic warfare? **[3]**

Q4C. Bring out the advantages of Digital Signal Processing over Analog Signal Processing in the field of Electronic Warfare with emphasis on the upgradability of features. **[5]**

Q5A. What are the three major domains that are to be intercepted simultaneously to get a good probability of intercept in an ELINT receiver? **[2]**

Q5B. How will one electronically attack a LPI Radar? **[3]**

Q5C. Elaborate on the different methods of electromagnetic propagation at different frequencies and elaborate why certain frequencies can be used for covert communication. **[5]**