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

II SEMESTER, M. TECH (DEFENCE TECHNOLOGY)
END SEMESTER EXAMINATION APRIL 2024
COURSE: TACTICAL BATTLEFIELD COMMUNICATION AND ELECTRONIC WARFARE (AAE 5283)

Duration: 3 Hrs **Date: 30/04/2024** **MAX. MARKS: 50**

Note:

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

Q1A. What are the various sensors in a Counter UAV System and their modes of method of detection. **[5]**

Q1B. What techniques are used for interdiction or countering the UAVs/drones. **[5]**

Q2A. Enumerate the various attacks on GSM Networks. **[5]**

Q2B. Define the following:- **[5]**

(i) Deregistration Spoofing.
(ii) Location update spoofing.
(iii) Camping on false BTS
(iv) Passive Identity caching
(v) Active Identity caching

Q3A. Explain and enumerate various detection techniques. **[5]**

Q3B. A four-attempt binomial detection approach is proposed. The detection threshold is set to provide Pd = 0.4 and Pfa = 10^{-3} for each attempt. Calculate the binomial probabilities of detection and false alarm associated with exactly one, two, three, and four detections out of four attempts. **[5]**

Q4A. Enumerate the following for Radar Jamming :- **[5]**

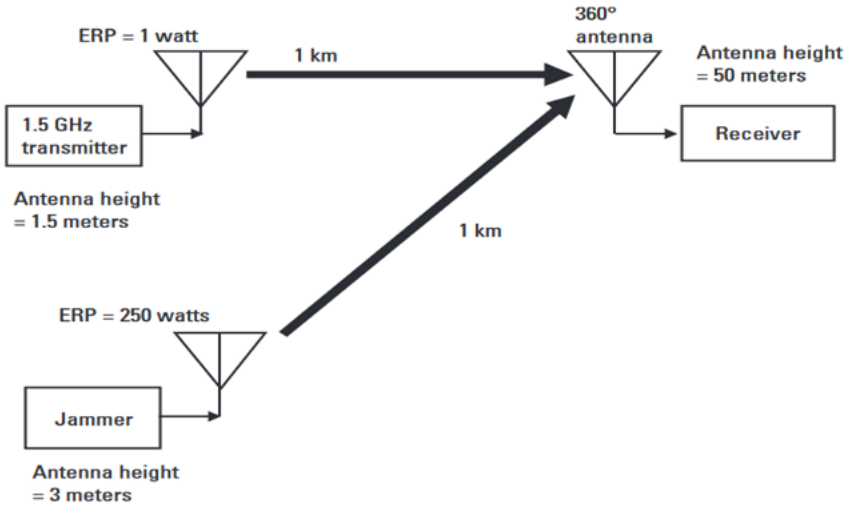
(i) Methods of Radar Jamming.

(ii) Purpose of Radar Jamming.

Q4B. A radar system has the following characteristics: peak transmit power P_R = 800 kW, antenna gain in the direction of the target G_{RT} = 38 dBi, carrier frequency fc = 3 GHz, signal processing gain G_P = I, receiver noise figure F_R = 6 dB, receiver bandwidth B_R = 750 kHz, total radar related losses L_R = I 3 dB, and radar transmit loss L_R, = 2 dB. A target with a radar cross section = 5 m^2 is at a radar-to-target range RRT = 150 km. Compute the following: (a) the transmitted effective radiated power, ERP_R (watts and dBW); (b) the radar power density at the target; (c) the power reflected off the target back to the radar; (d) the received power density at the radar receive antenna; (e) the received single-pulse target signal power, S (watts and dBW); (f) the radar receiver thermal noise power, N (watts and dBW); and (g) the single-pulse target signal-to-noise ratio, SNR (no units and dB). **[5]**

Q5A. What are the various emitter Location or Direction Finding techniques? **[5]**

Q5B. (i) Consider the jamming geometry shown in Figure below. You are jamming the uplink of a cell phone, which means that you must jam the receiver in the cell tower. The cell phone has 1-watt ERP at 1.8 GHz and is 1 km from the tower, 1m above the ground. The tower is 50m high. The jammer has 250 watts ERP from an antenna which is 3m above the ground 1 km from the tower. What is the J/S? **[5]**



(ii) Consider the jamming geometry shown in Figure below. You are jamming the downlink of a cell phone, which means that you must jam the receiver in the cell phone. The cell tower has 50-watt ERP at 1.8 GHz and is 1 km from the cell phone which is 1m above the ground. The tower is 50m high. The jammer has 250-watts ERP from an antenna which is 3m above the ground 500m from the cell phone. What is the J/S?