



M.TECH DEGREE EXAMINATIONS: APRIL/MAY 2024

(Regulation 2018)

Second Semester

DEFENCE TECHNOLOGY

P18DTT2019: Tactical Battlefield Communication and Electronic Warfare

COURSE OUTCOMES

CO1: Understand the nature of tactical battlefield communication

CO2: Calculate communication link performance.

CO3: Calculate the requirements for interception of tactical communication.

CO4: Calculate the requirements for emitter location, intercept and jamming of tactical comm. signals including weapon control link, UAV links, Cell phone links.

CO5: Use various tools to perform electronic warfare calculations.

Time: Three Hours

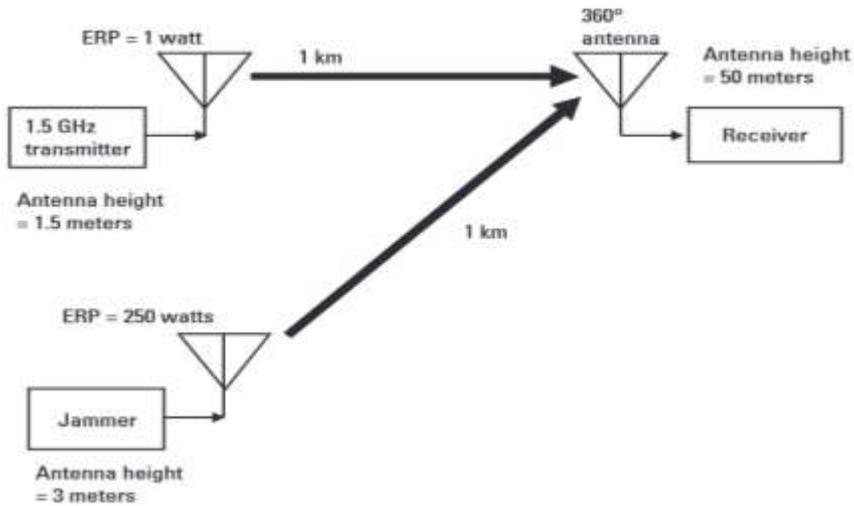
Maximum Marks: 100

Answer all the Questions:-

PART A (5 x 20 = 100 Marks)

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|----|----|---|----|-----|-------------------|
| 1. | a) | Explain the various sensors in a counter UAV System and their modes of method of detection. | 10 | CO1 | [K ₂] |
| | b) | Explain the techniques which are used for interdiction or countering the UAVs/drones. | 10 | CO1 | [K ₂] |
| 2. | a) | Enumerate the various attacks on GSM Networks | 10 | CO2 | [K ₂] |
| | b) | Explain the following:-
(i) Deregistration Spoofing.
(ii) Location update spoofing.
(iii) Camping on false BTS
(iv) Passive Identity caching
(v) Active Identity caching | 10 | CO2 | [K ₂] |
| 3. | a) | Explain and enumerate various detection techniques. | 10 | CO3 | [K ₃] |

- b) A four-attempt binomial detection approach is proposed. The detection threshold is set to provide $P_d = 0.4$ and $P_{fa} = 10^{-3}$ 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. 10 CO3 [K₃]
4. a) Enumerate the following for Radar Jamming :- 10 CO4 [K₄]
 (i) Methods of Radar Jamming
 (ii) Purpose of Radar Jamming
- b) 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 $f_c = 3$ GHz, signal processing gain $G_P = 1$, receiver noise figure $F_R = 6$ dB, receiver bandwidth $B_R = 750$ kHz, total radar related losses $L_R = 13$ dB, and radar transmit loss $L_{R,t} = 2$ dB. A target with a radar cross section $\sigma = 5$ m² is at a radar-to-target range $R_{RT} = 150$ 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). 10 CO4 [K₄]
5. a) Explain the various emitter location or Direction finding techniques. 10 CO5 [K₄]
 b) (i) Consider the jamming geometry shown in Figure below. 5 CO5 [K₄]
 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?



ii) Consider the jamming geometry shown in Figure below.

5 CO5 [K4]

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?

