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Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: ECE3057 **Course Name:** Radar Engineering

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3	CO4
Marks	24	22	22	22

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Which core physical principle governs the functioning of radar systems?	2	CO1	BT2
2	How does the duplexer contribute to the operation of a pulsed radar transceiver?	2	CO1	BT2
3	A radar operates with a pulse repetition frequency of 2000 Hz. Determine the maximum range at which a target can be detected without range ambiguity.	2	CO2	BT2
4	How do path and system losses influence the maximum detectable range predicted by the radar equation?	2	CO3	BT2
5	What is the role of Albersheim's empirical formula in radar detection analysis?	2	CO4	BT3

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	Draw the block diagram of a pulsed radar system and give a concise account of the role of each of its constituent blocks.	10	CO1	BT2
7	Present a tabular overview of the radar frequency bands and discuss the principal applications associated with each.	10	CO1	BT2

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	A pulsed radar system operating at a carrier frequency of 1 GHz radiates a peak transmitted power of 2 MW through an antenna having a gain of 30 dB. The system is intended to detect a target with a radar cross-section of 3 m^2. Given that the maximum detection range of the radar is 180 km, calculate the minimum detectable signal power (Smin) at the receiver.	10	CO2	BT2
9	A pulsed radar transmits a peak power of 100 kW through an antenna with a gain of 35 dB and operates at a wavelength of 10 cm. The radar is used to detect a target with a radar cross-section of 3 m^2. Assuming a minimum detectable signal power of 5×10^{-14} W, determine the maximum range at which the target can be detected.	10	CO2	BT2

PART D: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT

10	Categorize the different types of losses that affect a radar system when it determines the range of a target.	10	CO3	BT2
11	Examine the influence of noise on radar receiver performance, with particular emphasis on the signal-to-noise ratio (SNR) and the noise figure in cascaded receiver stages.	10	CO3	BT2

PART E: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
12	A ground-based surveillance radar operates with the following specifications: **Parameter** / **Value** Peak transmitted power, Pt — 1.5 MW Antenna gain, G — 35 dB Operating wavelength, λ — 0.032 m Target radar cross-section, σ — 5 m^2 Minimum detectable signal power, Pmin — 2 × 10^{-13} W Two-way atmospheric attenuation loss — 2.0 dB Two-way rain attenuation loss — 3.0 dB Antenna / feed (hardware) loss — 1.5 dB Calculate the actual maximum detection range of the radar after accounting for the above losses.	10	CO4	BT3
13	A ground-based surveillance radar operates at 10 GHz (λ = 0.03 m) with a peak transmitted power P_t = 1 MW and an antenna gain G = 34 dB. The target of interest has an RCS σ = 5 m^2. The receiver has a noise bandwidth B = 1 MHz, a noise figure F = 5 dB, and requires a minimum SNR of 13 dB for reliable detection. Find the maximum detection range.	10	CO4	BT3