

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO-22)

CLASS: BTECH
BRANCH: ECE

SEMESTER : VII
SESSION : MO-22

SUBJECT: EC423 RADAR ENGINEERING

TIME: 03 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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- Q.1(a) Explain how integration of radar pulses helps achieving the required probability of detection for a given probability of false alarm [2]
- Q.1(b) Using the concept of minimum detectable signal in presence of receiver noise, derive the radar's range equation [3]
- Q.1(c) Using radar range equation, determine the required transmit power for a radar given $P_{rmin} = 10^{-12}$ Watts, $G=27$ dB, $\lambda=0.23$ m, $PRF=262$, $\sigma=5.0$ m². [5]
- Q.2(a) Compare and contrast coherent and non-coherent MTI radar system [2]
- Q.2(b) Calculate the magnitude of the output of double delay line canceller in an MTI radar receiver [3]
- Q.2(c) Draw a block diagram of a simple digital MTI signal processor and illustrate it's functioning. State advantages of digital signal processing over analog delay lines. [5]
- Q.3(a) State radar signal estimation parameters and tracking functions once the target is detected and their respective resolution [2]
- Q.3(b) How is range tracking computed? [3]
- Q.3(c) Explain angle error signal is computed accurately in monopulse radar receiver antenna system with sum and difference channels than other from known techniques [5]
- Q.4(a) Define normalized RCS (σ_0) and clutter reflectivity. [2]
- Q.4(b) Explain with a graphical representation how do sea clutters depend on grazing angle. [3]
- Q.4(c) How can we detect the presence of desired targets under the existence of undesired clutters. Write about clutter measurement models? [5]
- Q.5(a) Explain the relationship between the aperture illumination and the generated radiation pattern. [2]
- Q.5(b) Define Radiation resistance, cross polarization, and radiation efficiency [3]
- Q.5(c) Narrate receiver protector technologies. Elucidate the working principles of major types of duplexers. [5]

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