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Paper Id: 131621 **Roll No:** [redacted]

B TECH

(SEM-VIII) THEORY EXAMINATION 2017-18

INTRODUCTION TO RADAR SYSTEMS

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections.

2. Assume any missing data.

SECTION A

1. Attempt *all* questions in brief. **2 x10 = 20**

a. What do you understand by term RADAR?
b. Calculate the range of a target if the time taken by the radar signal to travel to the target and back is 100 µs.
c. What is Pulse Repetition Frequency?
d. Write short note on Blind speed.
e. What do you understand by term Tracking Radar?
f. How MTI radar is different from other radar systems?
g. What do you understand by automatic detection?
h. What do you mean by false alarm?
i. What is the clutter reduction techniques used in radar?
j. Briefly discuss about the sea clutter?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. With the help of schematic block diagram, explain radar transreceiver system.
b. What is Doppler Effect & how it is useful in long distance communication. What are the methods of overcoming the problems of blind speed in radar?
c. Explain with the help of block diagram the Conical Scan Tracking Radar.
d. What are the different types of detection used in Radar? Explain zero-crossing detector with diagram.
e. What is Ambiguity Function? Discuss the Ambiguity function of a simple pulse.

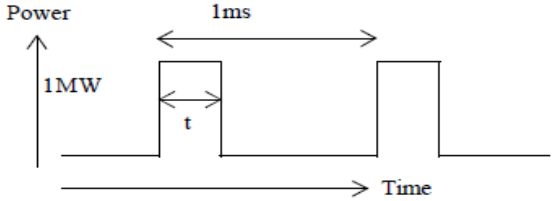
SECTION C

3. Attempt any one parts of the following: **10 x 1 = 10**

a. Derive the expression for simple form of radar range equation. Radar is operating at 10GHz with the peak power of 500KW, the power gain of antenna is 5000 & minimum power of the receiver is 10^{-14}. Calculate the maximum range of radar if the effective area of antenna is $10m^2$ & radar cross-section is $4m^2$.

b. Explain various antenna parameters. A typical waveform of radar is shown below in figure. Some parameters of radar are shown in figure. Consider t=1µs. Calculate:

i. Average Power.
ii. Duty Cycle.
iii. Maximum Range of Radar.



4. Attempt any one parts of the following: **10 x 1 = 10**

a) Explain MTI radar with suitable block diagram. Also give its applications. Compare Pulse Doppler Radar & MTI radar with block diagram.

b) Explain the use of delay line cancellers. Describe various types of delay line canceller used in MTI radar. Explain with frequency response of the delay line cancellers.

5. Attempt any one parts of the following: **10 x 1 = 10**

a) Explain in detail the Automatic Tracking with Surveillance radars.

b) How does Radar Servo Tracking system work? Explain sequential lobbing.

6. Attempt any one parts of the following: **10 x 1 = 10**

a) What do you understand by coherent, non coherent and binary integration? Discuss non coherent integration of non-fluctuating Targets.

b) Drive an expression for probability of false alarm. Distinguish from probability of miss.

7. Attempt any one parts of the following: **10 x 1 = 10**

a) What do you mean by Radar clutter? Explain various type of radar clutters. How they affect the performance of radar?

b) What do you understand by measurements of radar parameters? Enlist the various characteristics of the target that are to be extracted from the radar signals.