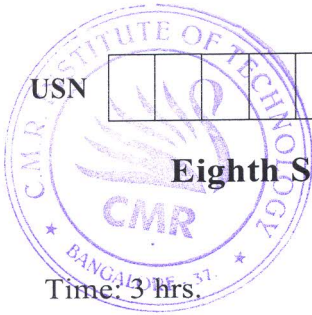


# CBCS SCHEME



17EC833

**Eighth Semester B.E. Degree Examination, Feb./Mar. 2022**

## **Radar Engineering**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. With derivation, explain simple form of radar range equation to obtain  $R_{max}$ . (08 Marks)
- b. List the various applications of Radar. (07 Marks)
- c. Write a note on Pulse Repetition Frequency (PRF) and Range Ambiguities. (05 Marks)

OR

- 2 a. Explain the Radar block diagram and operation. (08 Marks)
- b. Calculate the maximum range of Radar for the following specifications:  
Operating frequency,  $f = 10$  GHz  
Peak power transmitted by the radar,  $P_t = 400$  KW  
Effective aperture of receiving antenna,  $A_e = 5$  m  
Radar cross section of the target,  $\sigma = 30$  m<sup>2</sup>  
Power of minimum detectable signal,  $S_{min} = 10^{-10}$  W (07 Marks)
- c. Explain different Radar Frequencies with band designation. (05 Marks)

### Module-2

- 3 a. Obtain the prediction of range performance term of radar. (07 Marks)
- b. Explain the minimum detectable signal of radar system. (08 Marks)
- c. A radar system operates at 6 GHz, 3 MW power output. If the antenna diameter is 5m and the receiver bandwidth is 1.5 MHz and has a 12 dB noise figure. What is the maximum detection range for 1 m<sup>2</sup> targets? (05 Marks)

OR

- 4 a. Explain the various Radar Cross Section of Targets. (08 Marks)
- b. Write a short note on radar cross section of complex targets. (07 Marks)
- c. Explain plumbing loss of radar. (05 Marks)

### Module-3

- 5 a. With a block diagram, explain CW Radar. (08 Marks)
- b. Explain the filter Characteristic of delay line cancellers of radar system. (07 Marks)
- c. Write a short note on blind Speeds. (05 Marks)

OR

- 6 a. With a block diagram, explain MTI radar with power amplifier transmitter and power oscillator transmitter respectively. (10 Marks)
- b. An MTI radar operates at a PRF of 1.5 kHz. If the first blind speed of the target is found to be 60 m/sec, then determine the frequency of the transmitted microwave signal. (05 Marks)
- c. With block diagram, explain Moving Target Detector (MTD) signal processor. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-4**

- 7 a. Define monopulse tracker. Using block diagram, explain amplitude comparison monopulse tracking radar in one angle coordinates. (08 Marks)  
b. With a neat block diagram, explain conical scan tracking radar. (07 Marks)  
c. With a block diagram, explain AGC (Automatic Gain Control) portion of tracking radar receiver. (05 Marks)

OR

- 8 a. Explain Two-coordinate-amplitude comparison monopulse radar with block diagram (Azimuth and elevation) (08 Marks)  
b. Discuss the concept of phase comparison monopulse. (07 Marks)  
c. Compare monopulse and conical radar tracking system. (05 Marks)

**Module-5**

- 9 a. List the various functionalities of radar antenna. (08 Marks)  
b. Write a short note on parabolic reflector antennas. (05 Marks)  
c. Mention the role of Duplexer in Radar System. Illustrate the transmit condition and receiver condition in case of balanced duplexer. (07 Marks)

OR

- 10 a. Mention the different types of radar display system. (07 Marks)  
b. With block diagram, explain super heterodyne receiver. (08 Marks)  
c. Write a short note on receiver protectors. (05 Marks)

\*\*\*\*\*