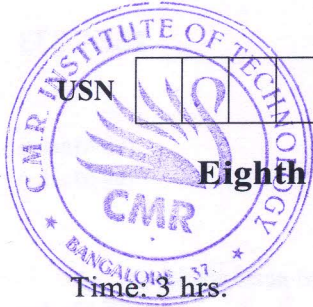


# CBCS SCHEME



15EC833

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

## **Radar Engineering**

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define the following with respect to pulse waveform:  
(i) PRF (ii) PRI (iii) Duty cycle (iv) Average Transmitted Power (08 Marks)  
b. With a neat block diagram, discuss the conventional pulse radar with a superhetrodyne receiver. (08 Marks)

OR

- 2 a. Derive the simple form of radar range equation. (06 Marks)  
b. List the applications of radar. (04 Marks)  
c. A radar transmitter has peak pulse power of 800 KW, a PRF of 1600 Hz and pulse width of 1.5  $\mu$ sec. Calculate:  
(i) The maximum unambiguous range  
(ii) Duty cycle  
(iii) Average transmitted power (06 Marks)

### Module-2

- 3 a. Discuss the envelope of a radar receiver output as a function of time to detect the signal in noise. (06 Marks)  
b. A tracking radar has a peak transmitted power of 850 KW and bandwidth of 3 MHz. The antenna used has a gain of 10,000 and an aperture of 4 m<sup>2</sup>. If this radar is able to detect a target of 100 m<sup>2</sup> cross section at a maximum distance of 600 km, determine the noise figure of the receiver in dB at room temperature of 300°K. (04 Marks)  
c. Discuss radar system losses. (06 Marks)

OR

- 4 a. Discuss the radar cross section of a sphere as a function of its circumference measured in wavelengths. (08 Marks)  
b. What is probability of false alarm, the duration of false alarms and the time between false alarms? (08 Marks)

### Module-3

- 5 a. A Doppler radar operates at 12 GHz and is used for traffic speed measurements. What are the Doppler frequencies for the speeds of 40 kmph and 100 kmph? (04 Marks)  
b. Discuss the block diagram of MTI radar that uses a power amplifier as the transmitter. (06 Marks)  
c. Explain the Blind phases, I and Q channels with relevant waveforms of Digital MTI processing. (06 Marks)

OR

- 6 a. Discuss sweep-to-sweep subtraction and the delay line canceller. (08 Marks)  
b. Discuss the block diagram of original moving target detector signal processor. (08 Marks)

**Module-4**

- 7 a. Discuss the types of tracking radar systems. (08 Marks)  
b. Explain the block diagram of conical scan tracking radar. (08 Marks)

**OR**

- 8 a. Explain the antenna patterns of sequential lobe switching and conical scan tracking. (08 Marks)  
b. Discuss the block diagram of single coordinate amplitude comparison monopulse tracking radar. (08 Marks)

**Module-5**

- 9 a. Explain the functions of radar antenna. (06 Marks)  
b. Define the following radar antenna parameters: (i) Directive gain (ii) Power gain (04 Marks)  
c. Discuss Balanced duplexers using dual TR tubes and two short-slot hybrid junctions. (06 Marks)

**OR**

- 10 a. Discuss the features of electronically steered phased array antenna. (06 Marks)  
b. Explain the noise figure of cascade networks. (04 Marks)  
c. Explain any three types of IEEE radar display presentations. (06 Marks)

CMRIT LIBRARY  
BANGALORE - 560 037

\*\*\*\*\*