



CBCS SCHEME

18EC823

Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024

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. Explain conventional pulse radar with a neat block diagram. (10 Marks)
- b. A S band radar has maximum unambiguous range of 60 nmi, with pulse width of 1.5 μ sec, transmitting a peak power of 800 kW. Find
 - i) Pulse repetition frequency
 - ii) What is the extent of pulse energy in space?
 - iii) How far apart in range must 2 equal size targets be separated?
 - iv) Average Power
 - v) Duty Cycle (10 Marks)

OR

- 2 a. Discuss the applications of radar in detail. (10 Marks)
- b. Derive simple form of radar range equation and deduce the equation to other forms also. (10 Marks)

Module-2

- 3 a. Discuss the prediction of range performance and minimum detectable signal in detail. (10 Marks)
- b. Derive the modified radar equation in terms of signal to noise ratio. (10 Marks)

OR

- 4 a. Explain
 - i) Microwave Plumbing loss
 - ii) Antenna losses
 - iii) Signal Processing losses. (10 Marks)
- b. Discuss PRF and range ambiguities with necessary figures and equations. (10 Marks)

Module-3

- 5 a. With a neat block diagram explain MTI radar. (08 Marks)
- b. Explain sweep to sweep subtraction and SDLC with relevant diagrams. (07 Marks)
- c. An MTI radar operating at $\lambda = 10$ cm has a PRF of 1 kHz. Calculate the first three blind speeds (05 Marks)

OR

- 6 a. Explain original moving target detector with neat diagram. (10 Marks)
- b. Discuss the compensation for blind phases with neat waveforms and also explain digital MTI processing with block diagram. (10 Marks)

Module-4

- 7 a. Explain different types of tracking radar systems. (08 Marks)
- b. Discuss amplitude comparison monopulse tracking radar for a single angular coordinate with neat block diagram. (08 Marks)
- c. Describe angle tracking in detail. (04 Marks)

OR

- 8 a. With a block diagram explain the working principle of conical scan tracking radar. (10 Marks)
b. Explain phase comparison monopulse in detail. (10 Marks)

Module-5

- 9 a. List the functions of the Radar antenna. (06 Marks)
b. Explain directive gain, power gain, antenna radiation pattern, effective aperture and polarization of radar antenna with necessary equations and figures. (06 Marks)
c. Discuss Electronically steered phased array antennas. (08 Marks)

OR

- 10 a. Explain different types of radar displays. (10 Marks)
b. What is the role of duplexers in radar system? Illustrate the transmit condition and receive condition in case of balanced mixer. (10 Marks)

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