15EC833

USN

Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 μsec. Calculate:
       i)   The maximum unambiguous range
       ii) Duty cycle
       iii) Average transmitted power   **(06 Marks)**

Module-2

3   a. Derive the modified RADAR equation interms of signal-to-noise ratio.   **(08 Marks)**
    b. Discuss briefly following types of signal losses in radar:
       i)   Microwave plumbing losses
       ii) Antenna losses
       iii) Signal-processing losses.   **(08 Marks)**

OR

4   a. Make use of portion of radar receiver block diagram, discuss with necessary equation the probability of false alarm and probability of detection.   **(08 Marks)**
    b. Illustrate the concepts of pulse-repetition frequency and range ambiguities in case of radar.   **(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. Explain one angle co-ordinate amplitude comparison mono-pulse tracking with neat diagram. (06 Marks)
   b. Give comparison of monopulse and conical scan tracking. (04 Marks)
   c. Explain phase comparison monopulse Radar. (06 Marks)

OR

8 a. Explain sequential lobing technique for tracking radar. (08 Marks)
   b. Explain two angle co-ordinate amplitude comparison monopulse with block diagram. (08 Marks)

Module-5

9 a. List the different functions served by radar antenna. (08 Marks)
   b. What is the role of duplexer's in radar system? Illustrate the transmit condition and receive condition in case of balanced duplexer. (08 Marks)

OR

10 a. Explain different types of radar display system. (08 Marks)
    b. List the advantages and limitations of electronically steered phase array antenna. (08 Marks)

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