USN | | | | | | | | | | | **18EC823**

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
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. Illustrate basic principle of radar with neat block diagram. **(10 Marks)**
   b. A ground based air – surveillance radar operates at frequency of 1300MHz (L band). Its maximum range is 200nmi for the detection of target with a radar cross section of one sequence meter ($\sigma = 1m^2$). Its antenna is 12m wide by 4m high, and the antenna aperture efficiency is $e_a = 0.65$. The receiver minimum detectable signal is S_{min} 10^{-13}. Determine the following :
   i)   Antenna effective aperture Ae and antenna gain
   ii) Peak transmitter power
   iii) PRF to achieve maximum unambiguous range of 200nmi
   iv) Average transmitter power, if pulse width is 2µs
   v)   Duty cycle. **(10 Marks)**

OR

2 a. Explain conventional pulse radar with super heterodyne receiver with neat block diagram. **(10 Marks)**
   b. Derive the simple form of RADAR equation and define all the quantities. **(10 Marks)**

Module-2

3 a. Write the reason of simple form of radar equation. **(06 Marks)**
   b. Derive the modified radar equation in terms of SNR. **(08 Marks)**
   c. Write an explanatory note on pulse repetition frequencies. **(06 Marks)**

OR

4 a. Make use of the portion of radar receiver discuss in detail probability of false alarm and probability detection. **(09 Marks)**
   b. Briefly discuss system losses. **(05 Marks)**
   c. Write the difference between simple targets and complex targets with example. **(06 Marks)**

Module-3

5 a. With the block diagram explain how MTI radar generates sufferance signal. **(10 Marks)**
   b. Illustrate digital MTI Doppler signal processor with neat block diagram. **(10 Marks)**

OR

6 a. Explain moving target detector with neat block diagram. **(10 Marks)**
   b. Explain moving briefly MTI improvement factor and n-pulse delay line canceller. **(10 Marks)**

Module-4

7 a. Define monopulse tracker using block diagram explain amplitude comparison mono pulse tracking radar in one angle co-ordinates. **(10 Marks)**
   b. Compare monopulse and conical radar based on their characteristics. **(10 Marks)**

OR

8	a.	Explain conical scan tracking radar with neat block diagram.	(10 Marks)
	b.	Discuss briefly types of radar that can provide the track of targets.	(10 Marks)

Module-5

9	a.	Illustrate transmit and receive condition of balanced duplexer with neat diagram.	(10 Marks)
	b.	List the advantage of electronically steered phased array antenna.	(10 Marks)

OR

10	a.	Explain different types of radar displays.	(10 Marks)
	b.	List the different function performed by radar antenna.	(10 Marks)

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