

B.ETCE 4th year 2nd Semester Examination 2019

Radar and Navigation Elect -II

Time : Three Hours

Full Marks : 100

Answer any four questions (from Q1. to Q.6).

Each question has two choices, answer any one of them.

Q.1 A

- a. What are the difference with conical scan and sequential lobbing? **10**
- b. Describe the operation of three channel monopulse RADAR for boresight detection. **10**
- c. What is phase comparison monopulse ? **5**

Or

Q.1 B

- a. Describe the operation of Magic TEE in construction of monopulse comparator **10**
- b. What is the monopulse tracking principle? Why amplitude comparison monopulse is preferred over phase comparison monopulse? **5+5=10**
- c. Define STT and ADT. **2+3= 5**

Q.2 A

- a. Why pulse compression is required? A RADAR transmits a 3.5 microsecond pulse at 5.70 GHz with a bandwidth of 4 MHz . The PRF is 550pps and 64 pulses processed together. Its antenna beamwidth is 1.2° . Find how target is spaced from one another at a range of 20Km. **6+6=12**
- b. Draw the conjugate filter based pulse compression radar and explain the same. **8**
- c. Draw and briefly explain the block diagram of Linear frequency modulation is pulse compression radar. **5**

Or

[Turn over

Q.2 B

- Define Range resolution. What are the limitation of short pulse?
- Describe the operation of reduction of time in range.
- Define Clutter.
- What is Range granularity.

3+5+6+6+5=25

Q. 3 A

- What is probability of false alarm and threshold detection? Define Radar range equation in terms of receiver noise and transmitter power separately 6+ 6+6= 18
- A RADAR has a PRF of 1250 pps. What is the maximum range which targets can have if they are to be in the first range zone 4
- The average time between the false alarm is 30 min and the receiver bandwidth is 0.4MHz. What is the threshold to noise ratio? 3

Or**Q.3 B**

- Deduce the RADAR range equation. What is the ambiguity between antenna parameter in RADAR range equation? 8+4=12
- How multiple time around echoes can be determined by varying PRF. 6
- What are RADAR system losses, describe each components? 7

Q. 4 A

- What is delay line canceller and explain the frequency response of the same. 3+7=10
- What is blind speed? What is the highest frequency of the RADAR can be operated if it is required to have a maximum unambiguous range of 200nmi and no blind speed less than 600kt. 4+ 5= 9
- Show that the product of the maximum unambiguous range and the first blind speed v_1 is equal to $c\lambda/4$ where c is the velocity of propagation and λ is the radar wavelength 6

Or**Q. 4 B**

- Describe the Clutter attenuation. 8
- Define Doppler ambiguity. How it is different with Range ambiguity? 3+3=6
- How, high RF frequency and high PRF can have effect on blind speed? 4

d. Describe the matched filter frequency response. 7

Q. 5. A

a. Explain the operation of pulsed Doppler RADAR by leading and trailing edge concept. 10

b. Explain the operation of each block in a pulsed RADAR. 8

c. What is high PRF pulsed Doppler RADAR ? 7

Or

Q. 5. B

a. What is a correlation Receiver? How a rectangular pulse can be approximated in matched filter? 5+5=10

b. Explain the operation of envelop detector. How it is different with I,Q detection? 5+5=10

c. Define ECM and spillover 5

Q. 6. A

a. Describe the receiver block of a RADAR which contains superheterodyne configuration.

b. What are the difference between CW and Pulsed RADAR.

c. Explain the operation of sweep to sweep subtraction operation in MTI RADAR.

10+5+5+5=25

Or

Q. 6. B

a. Describe the operation of MTI RADAR by using the standard block diagram.

b. Deduce Ambiguity diagram expression. Describe the ambiguity diagram of general case.

What happen in ambiguity diagram if the ideal spectrum component has several harmonics?

9+16=25