

AMIETE – ET (Current & New Scheme)

Time: 3 Hours

June 2018

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated

Q1. Choose the correct or the best alternative in the following: (2×10)

- a. With the 3MHz band width of the radar receiver, the range resolution realizable with the radar is

(A) 60m	(B) 50m
(C) 45m	(D) None of these
- b. The minimum range of detection by pulse radar depends on

(A) beamwidth of the antenna	(B) average transmitter power
(C) pulse width	(D) None of these
- c. The altitude of a heavenly body is measured in which system of coordinates?

(A) The celestial system	(B) The equatorial system
(C) The terrestrial system	(D) The horizon system
- d. If the radar is to have a maximum range of 250km, the maximum allowable PRF for unambiguous reception is

(A) 600 kHz	(B) 600 MHz
(C) 600 Hz	(D) None of these
- e. MTI radar is

(A) CW	(B) CW doppler radar
(C) FMCW	(D) Pulsed radar
- f. The blind speed of an MTI radar can be avoided by changing

(A) pulse repetition frequency	(B) carrier frequency
(C) antenna rotation	(D) transmitted power
- g. Sea clutter returns occur

(A) Due to reflections from rain clouds	(B) Due to land reflections
(C) At short ranges	(D) None of these
- h. Duplexer is called

(A) a switch	(B) coupler
(C) TR switch	(D) amplifier
- i. SONAR is used to detect objects moving

(A) at variable speed	(B) at supersonic speed
(C) under water	(D) away from location of RADAR

Code: AE78/AE126

Subject: RADAR AND NAVIGATIONAL AIDS

- j. Clutter on PPI due to rain can be reduced by use of
 (A) Enhanced switch (B) Radar ON/OFF switch.
 (C) Delay switch (D) A/C rain control

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. For maximum unambiguous range of 1000 KW, calculate the PRF required for radar. (6)
 b. Clearly explain radar frequencies and electromagnetic spectrum. (5)
 c. Draw a general block diagram of radar and explain the function of each part. (5)
- Q.3** a. Derive an equation to show the relationship between maximum radar range and antenna gain. (6)
 b. Derive an expression for maximum detectable signal to noise ratio. (6)
 c. Explain following in signal detection: (4)
 (i) Threshold detection (ii) Missed detection
- Q.4** a. A target is closing on a radial of radar with a velocity of 200 knots. The radar transmits a continuous wave at a wavelength of 5 cm. What will be the Doppler shift of the target? What will be the Doppler shift if the target alters its course by 45°? Given 1 knots = 0.508m/sec. (8)
 b. Write a short note on the following: (4×2)
 (i) N-pulse Delay Line Canceller
 (ii) High-prf Pulse Doppler Radar
- Q.5** a. Explain in detail the Filter characteristics of the delay-line canceller. (8)
 b. Briefly explain the various types of detectors used in RADAR receivers. (8)
- Q.6** a. (i) List out the applications which require information about the radar backscatter from the land. (4)
 (ii) Write short note on radar signal scattering from snow. (4)
 b. Derive the equation for Surface-Clutter Radar in case of low grazing angle.. (8)
- Q.7** a. Explain the working of phased array antenna. (8)
 b. Discuss Directive Gain and Power Gain parameters of radar antenna. (8)
- Q.8** a. State the factors influence the bandwidth of radar receiver. Write down the advantages of large bandwidth. (8)
 b. Explain the role and design features of RF low noise amplifier. (8)
- Q.9** a. Write notes on the following:- (4×2)
 (i) Conical Scan (ii) Sequential Lobing
 b. Explain the operation and applications of LORAN. (8)