ROLL NO. _____

Code: AE78/AE126 Subject: RADAR AND NAVIGATIONAL AIDS

AMIETE – ET (Current & New Scheme)

Time: 3 Hours **December 2016** **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.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. With a 10GHz radar, if the antenna diameter is 2m, the beamwidth of the antenna is
(A) 2degree **(B)** 5degree
(C) 1degree **(D)** 6degree

b. With the 3MHz band width of the radar receiver, the range resolution realizable with the radar is
(A) 50m **(B)** 60m
(C) 45m **(D)** None of these

c. The most of the targets occur in _____.
(A) The optical region **(B)** The mile region
(C) Rayleigh region **(D)** None of these

d. The sea clutter depends on _____ .
(A) Wave height **(B)** Wind speed
(C) Length of time and distance **(D)** All of these

e. The MTI Radar is used by traffic control police to measure speed of cars. If the Doppler frequency shift measured from the moving car is 1.6KHz, speed of car is_____.
(A) 80km/hr **(B)** 86.4km/hr
(C) 89km/hr **(D)** None of these

f. The function of delay line canceller in MTI receiver is
(A) snigle delay line **(B)** converts bipolar video to unipolar video
(C) acts as filter **(D)** All of these

g. Various tracking Radar for MTI means
(A) range tracking **(B)** angular tracking of the target
(C) Doppler frequency tracking **(D)** All of these

h. The directive gain of an antenna _____ greatly by placing it at the focus of a parabolic reflector
(A) decreases **(B)** increases
(C) remains constant **(D)** None of these

i. The monopulse tracking of radar antenna is
(A) lobe switching
(B) continuous tracking
(C) simultaneous beam switching technique
(D) conical scanning

j. LORAN stands for
(A) Long range navigation **(B)** Long distance communication
(C) Short distance navigation **(D)** Short distance communication

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

Q.2 a. What is radar? Derive the expression for Radar range equation. Justify that shorter the wave length, range will be higher. **(10)**

b. For maximum unambiguous range of 1000 KW, calculate the PRF required for radar? **(6)**

Q.3 a. What is the effect of noise in Radar Receiver Signal? How does it affect radar range equation? **(8)**

b. What is meant by radar cross section of Targets? What are the differences between Simple targets & Complex targets? **(8)**

Q.4 a. Draw the block diagram of MTI radar and explain the working of its each block. **(10)**

b. What is meant by blind speed? An MTI Radar is operating at 10 GHz with a PRF of 1000Hz. Calculate the lowest three blind speeds? **(6)**

Q.5 a. What is the importance of matched filter in Radar Receiver? How does it behave with frequency response function? Explain. **(8)**

b. What is the function of Detector in Radar Receiver? What are the requirements of automatic detection in radar receivers? **(8)**

Q.6 a. What is the basic difference between surface clutter and volume clutter? Explain the properties of sea clutter. **(8)**

b. What is land clutter? How does it effect in radar back scatter in various applications? **(8)**

Q.7 a. Explain gain of antenna. Enlist different types of feeds used for parabolic reflector antenna. **(10)**

b. Explain the function of electronic beam steering. **(6)**

Q.8 a. Enlist all the important functions of Radar Receiver. Define Receiver noise figure. How does it affect Radar due to loss in the transmission line? **(10)**

b. Enlist different types of Radar displays.(name only). **(6)**

Q.9 a. What is meant by monopulse tracking? What are two different methods of measuring monopulse angle? How do they differ from each other? **(10)**

b. Write short notes on the following (**any one**) **(6)**
(i) LORAN (ii) Radio detection finding