ROLL NO. _____

Code: AE78 Subject: RADAR AND NAVIGATIONAL AI

AMIETE – ET (NEW SCHEME)

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. If the peak transmitted power in a radar system is increased by a factor of 16, the Maximum range increases by a factor of

(A) 2 **(B)** 4
(C) 8 **(D)** 16

b. The unit of duty cycle is

(A) sec **(B)** Hertz
(C) nil **(D)** Meter

c. The biggest disadvantage of CW Doppler radar is that

(A) It does not give target velocity **(B)** It does not give target range
(C) It does not give target position **(D)** None of them

d. A solution to blind speed is

(A) To vary PRF **(B)** To use monopulse
(C) To use MTI **(D)** To change Doppler frequency

e. After a target has acquired , the best scanning system for tracking is

(A) Helical **(B)** Conical
(C) Spiral **(D)** Nodding

f. 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

g. Sea clutter returns occur

(A) due to reflections from rain clouds
(B) At short Ranges
(C) due to land reflections
(D) None of the above

h. The signal arriving from transmitter to the display unit is the

(A) Trigger **(B)** Echoes
(C) Heading marker **(D)** Bearing information

i. In a RADAR , IF amplifier is tuned to the _____ the local oscillator and echo frequency.

(A) Sum of **(B)** Difference between
(C) Both **(A)** and **(B)** **(D)** None of the above

j. VOR stands for

(A) VHF omni range **(B)** Visually operated RADAR
(C) Voltage output of regulator **(D)** None of the above.

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

Q.2 a. Discuss the Frequency bands used for radar system. **(8)**

b. Draw and Explain block diagram of simple pulse radar system. Explain different applications of radar. **(8)**

Q.3 a. Explain the maximum unambiguous range, minimum detectable signal, and other factors affecting the maximum radar range **(8)**

b. Use the radar range equation to determine the required transmit power for the TRACS radar given $P_{rmin} = 10^{-13}$ Watts, G=2000 , λ=0.23m, PRF=524,and σ=2.0m^2 **(8)**

Q.4 a. Explain function of COHO & STALO in MTI radar **(8)**

b. Describe the method of staggering pulse repetition frequency to reduce the effect of blind speeds in an MTI system **(8)**

Q.5 a. What do you mean by clutter? Discuss the types of clutter and Explain detection of target in sea clutter **(8)**

b. Explain effect of weather on radar. **(8)**

Q.6 a. Briefly explain the various types of detectors used in RADAR receivers. **(8)**

b. Define matched filter and give its frequency response function. **(8)**

Q.7 a. Write short note on Advantages, limitations and applications of antenna arrays in radar systems **(8)**

b. A parabolic reflector has radiation characteristics whose half power beamwidth is 6^{o}. Find out its null-to-null beamwidth and power gain. **(8)**

Q.8 a. Substantiate the requirement of duplexers in efficient radar systems. Describe the operation of branch and balanced type duplexers with necessary diagrams **(8)**

b. Define and explain conversion loss of a mixer and noise temperature ratio. **(8)**

Q.9 a. Explain in detail about LORAN navigation system. **(8)**

b. With the help of a block diagram, explain the working of Amplitude comparison monopulse tracking radar. **(8)**