

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013****Subject Code: 181103****Date: 09/05/2013****Subject Name: Radar and Navigational Aids****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Range estimation using basic RADAR equation may be lagging by 50% , **07**
How we can improve the accuracy of estimation of RADAR range? Justify your answer by considering various factors affecting the radar Range in brief.

(b) What is the peak power of radar whose average power is 200 W, Pulse width is 1 μ Sec, and pulse repetition frequency is 1000Hz? What is the Range (nmi) of this ground based air surveillance radar if it has to detect a target of 2m², When it operates on the S-band frequency of 2.9GHz, With rectangular shaped antenna having 5m wide and 2.7m height antenna aperture efficiency is 0.6 and minimum detectable signal S_{min} is equal to 10^{-12} ? **07**

Q.2 (a) How Loop antenna can be used for direction finding? What is the problem of direction ambiguity? How can we solve this problem? **07**

(b) What do you mean by Doppler velocity? Prove that it depends on target's radial velocity, derive the relation between Doppler velocity and Blind velocity and show that Doppler filters can't see the target if it is moving with blind velocity. **07**

OR

(b) What is the difference between MTD and MTI? With the help of necessary block diagram Explain the working of Moving target detector. **07**

Q.3 (a) What is the reason for very high scanning speed of Phased array antenna compared to parabolic reflector antenna? How the steering mechanism works in linear phase array? Configure Digital Phase shifter with four bit diode switch line length with $1/16$ Quantization which gives 135° phase shift. **07**

(b) Derive a RADAR equation for detection of rain. **07**

OR

Q.3 (a) How RCS is modeled? What scenarios are addressed by Swerling Case-I to Case-IV? **07**

(b) How the severity of clutter disturbance is addressed by Space time adaptive signal processing (STAP) in case of an Air born RADAR? **07**

Q.4 (a) Why FMCW is dominated by pulsed Doppler RADAR as time progresses since WW-II? **07**

(b) What is VOR? Explain its working **07**

OR

Q.4 (a) For air surveillance radar Explain how Tracking is done (TWS)? **07**

(b) Explain working of Microwave landing system. **07**

Q.5 (a) How we can use RADAR for imaging? Explain working of SAR? **07**

(b) Explain working of modern GPS system. **07**

OR

Q.5 (a) Write short notes on Doppler Navigation. **07**

(b) Explain working of the LORAN system. **07**
