GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII EXAMINATION – WINTER 2015

Subject Code:181103   **Date:12/12/2015**
Subject Name: Radar and Navigational Aids
Time: 2:30pm to 5:00pm   **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)** How can we improve the estimation of RADAR range by adding multiple radar echo Pulses ? Justify it.Obtain RADAR range equation considering effect of 'n' number of independent pulses.   07

(b) A radar mounted on automobile is used to find distance to a vehicle travelling in front of it .Radar operates at 9370 MHz (x band) with pulse width of 9 ns the maxi. range is 400 ft. Find, (i) PRF (ii) range resolution (in meters) (iii) If antenna beam width were 7 degree, what would be cross range resolution(meters) at a range of 400 ft ?(iv) find gain of 1ft by 1ft antenna with antenna efficiency of 0.7 ? (v) find average power required to detect 10 square meter RCS car at a range of 400 ft ,if Smin = 0.4 pico watt.   07

Q.2 **(a)** How vertical antenna can be used for sense finding? Explain it with different antenna patterns and antenna effect.   07

(b) What do you mean by Blind phase? Differentiate between blind speed and blind speed with neat waveforms .With the help of necessary block diagram explain the working of a digital MTI Doppler signal processor.   07

OR

(b) (i) How clutter Attenuation is obtain in the delay line cancellers?   03
  (ii) Explain the need of staggered pulse repetition frequencies in case of MTI Doppler Filters to reduce the effect of blind speed.   04

Q.3 **(a)** Compare all diode based phase shifters. How can we configure hybrid coupled phase bit and periodically loaded line phase shifter?   07

(b) Define Normalized RCS .Derive Surface clutter RADAR equation.   07

OR

Q.3 **(a)** What are special cases of the chi-square target model ? Explain Rice and log - normal pdf briefly. Which target model is better to use ?   07

(b) Why the conical scan is more preferable over the sequential lobing? Justify it.   07

Q.4 (a) Explain how FMCW radar is used as Aircraft radio altimeter.

(b) What is VOR? Explain reference phase recovery and bearing measurement ability of VOR Receiver with neat diagram.   07

OR

Q.4 **(a)** Explain the working of conican scan tracking radar with its block diagram.   **07**

(b) Explain TACAN Beacon Equipment with its receiver bearing circuit.   **07**

Q.5 **(a)** How N-pulse Delay line cancelers are effective for MTI RADAR?   **07**

(b) Explain working of Precision approach radar of GCA with following   **07**
(i)Azimuth and Elevation display (ii)coverage of PAR antenna
(iii)position of PAR with respect to runway.

OR

Q.5 **(a)** Write short note on Navstar GPS Receiver system.   **07**

(b) Explain working of DECCA Hyperbolic system.   **07**

****