

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII • EXAMINATION – WINTER • 2014

Subject Code: 181103

Date: 25-11-2014

Subject Name: Radar and Navigational Aids

Time: 02:30 pm - 05:00 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) List the four methods of navigation. Describe any one in detail 07
(b) Explain the GPS principle of operation and Position location determination algorithm. List the use of GPS system. 07

- Q.2 (a) What do you mean by VOR? Explain VOR receiving equipment. 07
(b) Why is a balanced modulator stage used in the radio-compass receiver ? Justify “The operation of the receiver is equivalent of that of one using coherent demodulation.” 07

OR

- (b) Enumerate the advantages of the Microwave Landing System over the ILS. Explain the technique by which the same frequency is used for guidance in the vertical plane, horizontal plane, back azimuth and flare. 07

- Q.3 (a) Discuss the merits of the frequency band or around 100 kHz for navigational aids with reference to (a) investment in antennas. (b) propagation characteristics, (c) ground wave and sky-wave signals, and (d) signal/noise ratio. 07
(b) With a neat sketch describe the TACAN beacon equipment. Explain how the desired antenna pattern is obtained and timing of the reference pulse groups is ensured. 07

OR

- Q.3 (a) i)What should be the pulse repetition frequency of a radar in order to achieve a maximum unambiguous range of 60 nmi? (2 Marks). 07
ii)How long does it take for the radar signal to travel out and back when the target is at the maximum unambiguous range?(2 Marks).
iii) If the radar has a peak power of 800kW, what is its average power?(pulse width = 1.5μs)? What is the duty cycle (3 Marks).
(b) Describe briefly the behavior of the radar cross section in the microwave region of a raindrop and a large aircraft with respect to its dependence on a) frequency and b) viewing aspect. 07

- Q.4 (a) Briefly explain the basic principle of radar and draw the block diagram of the radar setup. 07
(b) How Loop antenna can be used for direction finding? What is the problem of direction ambiguity? Give the solutions for this problem. 07

OR

- Q.4 (a) What is the chief advantage of automatic detection and tracking? What are its limitations. 07
(b) For air surveillance radar Explain how Tracking is done(TWS)? 07

- Q.5 (a) Discuss FM-CW radar with block diagram. 07
(b) i) Explain the principle of threshold detection in the radar receiver to overcome the probability of false alarm 07
ii) What is a sense finder in direction finding? Illustrate the radiation pattern of the

antenna for different ratios of vertical antenna output to the maximum loop antenna.

OR

- Q.5** **(a)** How do tracking and scanning radar differ? Explain Monopulse tracking radar. **07**
- (b)** List the three different radar range equations. Discuss their significance and Justify “Maximum range of the radar is inversely proportional to the square-root of wavelength” **07**
