

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3171110

Date: 20/05/2026

Subject Name: Radar and Navigational Aids

Time: 02:30 PM TO 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.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1**
- (a)** What do you mean by multiple-time-around echoes? **03**
 - (b)** Write, explain and compare the three radar range equations. **04**
 - (c)** List the four methods of navigation. Describe any one in detail. **07**

- Q.2**
- (a)** Explain operation of Radar with the help of neat and clean block diagram. **03**
 - (b)** Mention the name of Navigation Satellites of different countries and explain in brief. **04**
 - (c)** What do you mean by Blind phase? Differentiate between blind speed and blind speed with neat waveforms. **07**

OR

- Q.2**
- (c)** Explain the Pulse Doppler radar with neat block diagram. Compare it with CW radar. **07**

- Q.3**
- (a)** Explain different types of duplexers used in RADAR. **03**
 - (b)** Define direction finder term and which antenna is used for this purpose and why? **04**
 - (c)** What is Doppler Effect? What is its application in MTI radar? Explain it in terms of Doppler frequency fd. **07**

OR

- Q.3**
- (a)** Describe minimum detectable signal and SNR with respect to radar. **03**
 - (b)** Explain Sea clutter. **04**
 - (c)** Explain sequential lobing & Conical scanning with neat diagram. **07**

- Q.4**
- (a)** Explain the GPS Principle of operation. **03**
 - (b)** Explain briefly: **04**
 - (i) Complex Target (ii) Pulse repetition frequency and range ambiguities
 - (c)** Draw the block diagram of MTI radar with Power oscillator transmitter and explain its operation. **07**

OR

- Q.4**
- (a)** Explain the components of Doppler navigation system. **03**
 - (b)** Mention the advantages of Electronic Scanning Radar. **04**
 - (c)** What is the principle of TACAN? Explain working of TACAN with the help of simple block diagram. **07**

- Q.5**
- (a)** Draw neat block diagram of FMCW radar. **03**
 - (b)** Define radar clutter & prove that clutter power is inversely proportional to the square of the range **04**

- (c) What is the need for ILS at the airport? Explain the localizer and glide slope systems of ILS with radiation pattern of antennas in each case. **07**

OR

- Q.5** (a) Define the following: (i) Dwell Time ii) Radar Cross Section iii) PRT **03**
- (b) Explain principle of hyperbolic electronics system and name four different hyperbolic navigational systems. **04**
- (c) Explain GAGAN and IRNSS-NAVIC Receiver System. **07**
