

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– VIII (OLD) EXAMINATION – WINTER 2021****Subject Code:181103****Date:29/11/2021****Subject Name:Radar & 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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain the basic working principle of radar and derive the equation for determining maximum range of radar **07**  
 (b) What is Doppler Effect? List advantages of pulse Doppler radar over CW radar. **07**
- Q.2** (a) Define the following terms: **07**  
 1) Pulse Repetition Frequency  
 2) Blind Speed  
 3) Clutter  
 4) Maximum Unambiguous Range  
 5) Doppler Effect  
 6) Effective Aperture  
 7) Multiple Time around Echoes  
 (b) How FMCW radar overcomes the shortcomings of Doppler CW radar? Draw the block diagram of FMCW radar and derive the expression for the radial velocity and the range of the moving target when the transmitted signal is modulated by the triangular waveform. **07**
- OR**
- (b) How do tracking and scanning radar differ? Explain Monopulse tracking radar. **07**
- Q.3** (a) Explain the block diagram of MTI radar with neat sketch in detail **07**  
 (b) Draw and explain block diagram of conical-scan tracking radar **07**
- OR**
- Q.3** (a) Why loop antennas are used in direction finding? Derive an expression for induced output voltage of loop antenna having N turns **07**  
 (b) Write a short note on different types of Radar displays. **07**
- Q.4** (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? **07**  
 (b) Explain TACAN Beacon Equipment with its receiver bearing circuit **07**
- OR**
- Q.4** (a) Explain Global Positioning system **07**  
 (b) What do you mean by VOR? Explain VOR receiving equipment **07**
- Q.5** (a) What is DME? Explain the operation of DME inside the aircraft **07**  
 (b) Explain in brief Instrument Landing System **07**
- OR**
- Q.5** (a) Explain working of the LORAN-A system **07**  
 (b) Explain Airborne Doppler navigation **07**

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