

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII (Old) EXAMINATION – WINTER 2019****Subject Code: 181103****Date: 27/11/2019****Subject Name: Radar & 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.

- Q.1** (a) What is Doppler effect? Briefly explain the working principle of pulse doppler radar with the help of block diagram. **07**
- (b) Derive the equation for maximum range of radar and discuss the factor affecting the radar range. **07**
- Q.2** (a) What is the peak power of the radar whose average power is 200W, pulse width is $1\mu s$ and PRF of 1000Hz? Also calculate the range of this radar if it has to detect a target with a radar cross section of $2m^2$ when it operates at a frequency of 2.9 GHz with an antenna that is 5m wide, 2.7m height, aperture efficiency of 0.6 and minimum detectable signal(MDS) is $10^{-12} W$. **07**
- (b) How FMCW radar overcomes the shortcomings of Doppler CW radar? Explain the principle and operation of FM-CW radar in brief. **07**
- OR**
- (b) Draw and explain working of MTI Radar. What is the difference between MTI radar and MTI radar with power oscillator? **07**
- Q.3** (a) What do you mean by tracking with radar? Explain block diagram of conical-scan tracking radar. **07**
- (b) Why loop antennas are used in direction finding? Derive an expression for induced output voltage of loop antenna having N turns. **07**
- OR**
- Q.3** (a) What is Phase Array Antenna and explain how the steering mechanism works in linear phase array? **07**
- (b) Write a short note on synthetic aperture radar (SAR). **07**
- Q.4** (a) Explain Airborne Doppler navigation. **07**
- (b) Explain Instrument landing system (ILS). What are the drawbacks of ILS? **07**
- OR**
- Q.4** (a) Describe the principle of VOR. Explain VOR Receiving equipment use for reference phase & bearing measurement. **07**
- (b) Explain the principle of working of LORAN A and explain how absolute delay is measured. **07**
- Q.5** (a) Explain TACAN Beacon Equipment with its receiver bearing circuit. **07**
- (b) Explain various methods of navigation in detail. **07**
- OR**
- Q.5** (a) Explain briefly DECCA Hyperbolic system. **07**
- (b) Write a short note on Global Positioning System. **07**
