

SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION NOV 2017

SUBJECT: RADAR AND NAVIGATION (ECE - 4032)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. A low power, short range radar has an overall noise factor 3. If the antenna diameter is 1 meter, the IF bandwidth is 500kHz, the operating frequency is 8GHz and the radar set is supposed to be capable of detecting targets of 5m² cross-sectional area at a maximum distance of 12km, what must be the peak transmitted pulse power? Derive the expression used.
- 1B. Explain the various antenna losses occur in radar range equation
- 1C. A ground-based air-surveillance radar has 340Hz pulse repetition rate, 1.5^{0} beam width, and an antenna rotation rate of 5 rpm. Calculate the number of pulses returned from a point target per scan.

(5+3+2)

- 2A. With a neat block diagram and relevant equations and sketches explain the working of FM-CW radar
- 2B. Compare deflection modulated display with intensity modulated display in radar
- 2C. A pulsed radar has a pulse repetition rate 1700 pulses/second and transmits rectangular pulses of duration 15μ S. What maximum range can a target have if no part of its delayed pulse is to overlap any part of a transmitted pulse and not be delayed more than one PRF interval?

(5+3+2)

- 3A. With relevant diagrams explain branch type duplexer, balanced duplexer and circulator type duplexer.
- 3B. With a neat block diagram explain the different subsystems of navigational satellite
- 3C. An FM CW Radar working at 4GHz has frequency excursions of 60MHz, a modulating frequency of 100Hz, and a range of 300 meters. Find the beat note frequency.

(5+3+2)

- 4A. Compare passive phased array radar with active phased array radar. Also explain the T/R module used in active phased array radar.
- 4B. With neat diagrams explain double delay line canceler, three pulse canceler and transversal filter for MTI signal processing. Also calculate the weights for three delay line canceler.

4C. An MTI radar operates at 5GHz, with a pulse repetition frequency of 800pps. Calculate the lowest three blind speeds of this radar.

(5+3+2)

- 5A. What are the drawbacks of ILS? How is it overcome in MLS? With neat diagrams explain MLS.
- 5B. Explain triangulation and three different segments of GPS
- 5C. Calculate the height of the geostationary orbit with the following data: Radius of earth=6371 km, Mass of earth= 5.972×10^{24} kg, constant of gravitation= 6.67×10^{-11} m³kg⁻¹s⁻²

(5+3+2)