MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
MARCH 2021
SUBJECT: RADAR AND NAVIGATION (ECE - 4032)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.
- Show all the necessary steps with relevant equations and neat diagrams

1A. A radar operates at a 10.5 GHz center frequency, and transmits 100 watts peak power.The system has an antenna gain of 8 dB, a pulsewidth of 1µsec, and a 10kHz PRF. The radar is capable only of post-detection integration. If the radar observes a target of (non-fluctuating) RCS 10 square meters at range 0.5km, find the power received by the radar.

1B. With neat diagrams explain the working of MTI radar with power amplifier transmitter and power oscillator transmitter.

                                                                                                (5+5)

2A. With equations and neat diagrams, explain frequency modulated CW radar.

2B. With necessary diagrams, explain the factors affecting the maximum range of the radar. Also obtain the expression for modified radar range equation.

                                                                                                (5+5)

3A. With neat diagrams, explain the various subsystems of geosynchronous satellite.

3B. A Geostationary communication satellite has an uplink frequency of 6 GHz with an antenna elevation of 5^0. Transmitter power is 1kW. If transmitting antenna gain is 60 dB and receiving antenna gain is 0 dB, calculate the received power at the input of satellite receiver.

                                                                                                (5+5)

4A. With neat diagrams, explain beam forming processor, passive hydrophone array and display systems used in passive sonar systems.

4B. Explain the working of GPS and discuss its applications.

                                                                                                (5+5)

5A. Compare instrument landing system (ILS) with ground controlled approach(GCA).

5B. With neat diagrams, explain VHF omnidirectional range(VOR).

                                                                                                (5+5)