Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
FEBRUARY 2022
SUBJECT: RADAR AND NAVIGATION SYSTEMS (ECE -4084)

TIME: 75 minutes **MAX. MARKS: 20**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

Q. No.	Questions	Marks
1A.	A radar operates at a 10.5GHz center frequency, and transmits 100watts peak power.The system has an antenna gain of 8dB, 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.	5
1B.	Determine the range and Doppler velocity for an FM CW radar operating at 9.25GHz if the target is approaching the radar. Given the beat frequency f_b(up)=15kHz and f_b(down)=25kHz for the triangular modulation, the modulating frequency is 1MHz and Δf is 1kHz.	3
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.	2
2A.	With neat diagrams, explain the working of MTI radar with power amplifier transmitter and power oscillator transmitter.	5
2B	With neat diagrams, explain beam-forming processor, passive hydrophone array and display systems used in passive Sonar.	3
2C	With neat diagrams, explain the localizes and marker beacons used in instrument landing system.	2