Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS

VII SEMESTER B.TECH. (MECHATRONICS)

MAKEUP EXAMINATIONS, [Jan] [2023]

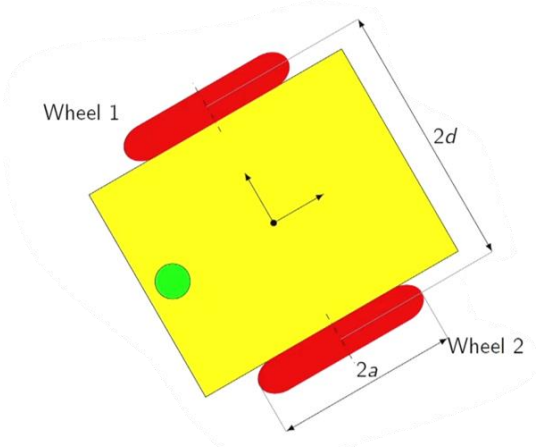
SUBJECT: ROBOT PATH PLANNING AND MOBILE ROBOTS

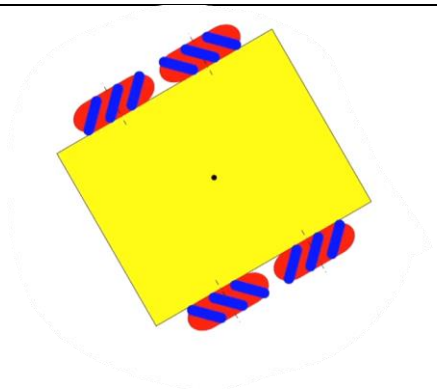
SUBJECT CODE: MTE 4061 **DATE: 07/11/2022**

Time:3 Hrs. **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any can be suitably assumed.

Q. No	Question	M	CO	PO	LO	BL
1A.	Identify the following with a broad application-oriented with detailed explanation. a. Dead Reckoning b. Accelerometer	**5**	**CO1**	**1,2**	**1**	**3**
1B.	Illustrate the legged locomotion and locomotion mechanism found in nature with neat sketches.	**3**	**CO1**	**1,2**	**1**	**3**
1C.	Illustrate in detail about the tracked slip or skid locomotion.	**2**	**CO1**	**1,2**	**1**	**3**
2A.	Determine the angular velocity of all the wheels in the figure given below.  Figure No.: Q-1A	**5**	**CO2**	**1,2**	**1**	**3**
2B.	Illustrate about the kinematics mobile robot animation in MATLAB of a mobile robot through pseudo code using Euler equation.	**3**	**CO2**	**1,2**	**1**	**3**
2C.	Determine the degree of maneuverability for the four wheeled Mecannum wheel drive robot as shown in the below figure:	**2**	**CO2**	**1,2**	**1**	**3**

	 **Figure No.: 2B**					
3A.	Illustrate about the skid steer Mecannum wheel four-wheel drive locomotion strategy for moving forward, backward and side wards and establish a code for achieving the above movements through pseudo code.	**5**	**CO3**	**1,2**	**1**	**3**
3B.	Illustrate the following terms with neat sketches: a. Statistically stable legged robot b. Dynamically stable legged robot c. Hopping Robots	**3**	**CO3**	**1,2**	**1**	**3**
3C.	Illustrate about the Holonomic and Non-Holonomic constraints for mobile robots?	**2**	**CO3**	**1,2**	**1**	**3**
4A.	Derive the relation of dynamics for wheeled mobile robot using Lagrangian method	**5**	**CO3**	**1,2**	**1**	**4**
4B.	Illustrate the significance of the hexapod robot performing motions.	**3**	**CO3**	**1,2**	**1**	**3**
4C.	Demonstrate the SLAM methodology for unknown environment exploration.	**2**	**CO3**	**1,2**	**1**	**3**
5A.	Explain below algorithms with neat sketches a. Configuration Space of two Revolute joint manipulator b. Artificial Potential Fields	**4**	**CO4**	**1,2**	**1**	**3**
5B.	Analyze, if a point robot is moving in an obstacle environment for reaching target location from source location. Identify the configuration space for the below environment given in the figure.  Figure 5B	**4**	**CO4**	**1,2**	**1**	**4**
5C.	Explain the path planning technique - visibility graph with the help of a neat sketch.	**2**	**CO4**	**1,2**	**1**	**3**