Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS

VII SEMESTER B.TECH. (MECHATRONICS)

END SEMESTER EXAMINATIONS, [Nov] [2022]

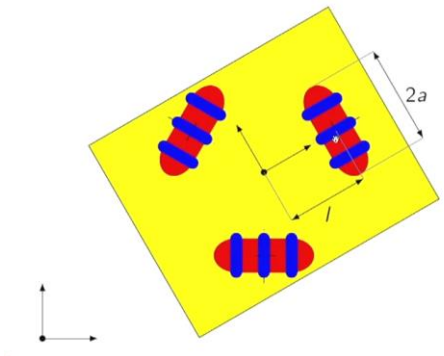
SUBJECT: ROBOT PATH PLANNING AND MOBILE ROBOTS

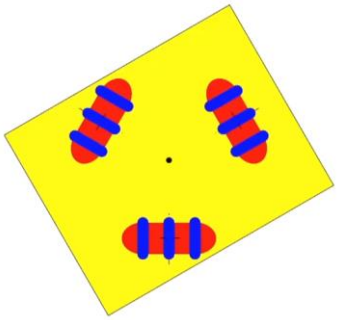
SUBJECT CODE: MTE 4061 **DATE: 30/11/2022**

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 each the following with a broad application-oriented explanation for underwater exploration. a. Autonomous Underwater Vehicle and its limitations b. Remotely Operated Vehicle and its limitations	**5**	**CO1**	**1,2**	**1**	**3**
1B.	Select the relevance of autonomous navigation technique on a flying robot using sensors such as Accelerometers, Gyroscopes and Global Positioning System.	**3**	**CO1**	**1,2**	**1**	**4**
1C.	Illustrate with neat diagram about the Inertial measurement Unit Strapdown algorithm.	**2**	**CO1**	**1,2**	**1**	**3**
2A.	Analyze the angular velocity of all the three wheels in the figure given below which is symmetrically arranged by the wheels. Assume necessary parameters.  **Figure No.: Q-1A**	**5**	**CO2**	**1,2**	**1**	**4**
2B.	Illustrate with neat diagram about the Joint – Space versus cartesian description in trajectory planning of the robot.	**3**	**CO2**	**1,2**	**1**	**3**
2C.	Determine the degree of maneuverability for the below figure given:	**2**	**CO2**	**1,2**	**1**	**3**

	 **Figure No.: 2C**					
3A.	Compose the mobile robot animation of a particular length and width through pseudo code in MATLAB. Establish a relation for converting the transformation for the moving mobile robot for animation.	**4**	**CO3**	**1,2**	**1**	**4**
3B.	Categorize the different types of wheels and their classification with neat sketches.	**4**	**CO3**	**1,2**	**1**	**3**
3C.	Demonstrate about the Holonomic and Non-Holonomic constraints for mobile robots?	**2**	**CO3**	**1,2**	**1**	**3**
4A.	Analyze the relation of dynamics for wheeled mobile robot using Lagrangian method	**5**	**CO3**	**1,2**	**1**	**4**
4B.	Considering a hexapod examine the gait analysis for forward locomotion with neat sketches.	**3**	**CO3**	**1,2**	**1**	**3**
4C.	Interpret, how to navigate the environment in the absence of GPS and external motion capture cameras? Demonstrate the methodology.	**2**	**CO3**	**1,2**	**1**	**3**
5A.	Analyze the below algorithms with neat sketches a. Probabilistic Road Maps b. Rapidly random exploring trees	**5**	**CO4**	**1,2**	**1**	**4**
5B.	Signify the challenges of a path planning technique called potential fields	**3**	**CO4**	**1,2**	**1**	**3**
5C.	Explain the path planning technique - visibility graph with the help of a neat sketch.	**2**	**CO4**	**1,2**	**1**	**3**