



PRESIDENCY UNIVERSITY

BENGALURU

Roll No.																			
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Mid - Term Examinations - March 2026

Date: 12-03-2026

Time: 02:00pm - 03:30pm

School: SOE	Program: B. Tech		
Course Code: MEC3099	Course Name: Autonomous Mobile Robots		
Semester: VI	Max Marks: 50	Weightage: 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	09	17	24	-	-

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2 marks.

5Q x 2M=10M

1	If the angular velocities of left and right wheels are 4 rad/s, in which direction does the robot move?	2 Marks	L1	C01
2	Summarize two characteristics of legged mobile robot.	2 Marks	L2	C01
3	Illustrate how many degrees of freedom the standard wheel and Swedish wheel have?	2 Marks	L2	C02
4	Explain heading sensors used in wheel robots.	2 Marks	L2	C03
5	Why is performance measure of sensors required?	2 Marks	L1	C03

Part B

Answer the Questions.

Total Marks 40M

6.	Elucidate in detail the following with respect to autonomous mobile robots (a) Maneuverability (b) Controllability by considering some examples of mobile robots.	10 Marks	L3	C01
Or				
7.	Derive the dynamic equations for 2 wheeled differential drive mobile robot.	10 Marks	L3	C01

8.	A differential drive mobile robot has the following parameters: Radius of each wheel is 0.1 m and robot base is 0.30 m. Initial pose is again $x = 0, y = 0, \theta = 30 \text{ deg}$. The mobile robot moves with angular velocities as $\omega_L = 3 \text{ rad/s}, \omega_R = 7 \text{ rad/s}$. Ignore the wheel inertia and friction losses. Robot moves in a horizontal plane. Determine linear velocity components of velocity in x-direction, y-direction and $\dot{\theta}$ of mobile robot with respect to global coordinate system.	10 Marks	L3	C02
Or				
9.	Derive the forward kinematics equations for Autonomous wheel mobile robot with 2 wheels and differential drive system by considering the global and body coordinate systems.	10 Marks	L3	C02

10	a	List the sensors used in Autonomous Mobile Robots and elucidate the working Compass sensors and Gyroscopes sensors.	10 Marks	L3	C03
	b	Identify parameters are considered in performance measure of sensors in mobile robots. Explain each of them in brief.	10 Marks	L3	C03
Or					
11	a	What is doppler effect-based sensor? Elucidate the working of such sensors with neat sketch and applications of it.	10 Marks	L3	C03
	b	Elucidate the working of vision-based sensors deployed in autonomous mobile robots.	10 Marks	L3	C03