

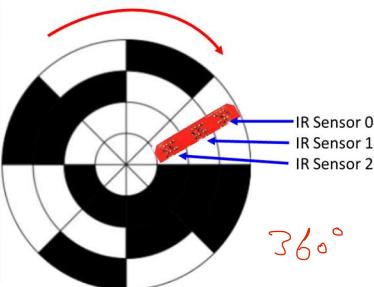
only by  
thermal  
IR  
Sensors

CMPE 483- Introduction to Robotics  
Spring 2025  
Sample Questions for Quiz 3

Student Name: \_\_\_\_\_ ID: \_\_\_\_\_  
(PLEASE WRITE the correct answer's letter ONLY in the right hand column)

1	Because of its 'nature', the IR sensor can also be used for measuring _____ in addition to the distance from an obstacle. (a) Temperature (b) Pressure (c) Speed (d) None of these.	A <span style="background-color: yellow; border-radius: 50%; padding: 2px 5px;">C</span>
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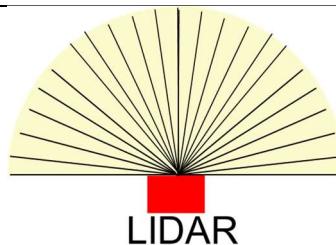
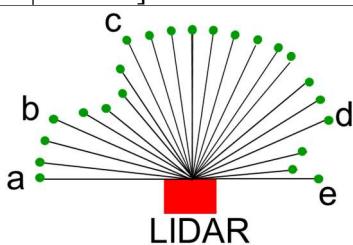
Consider the following system for position measurement of a motor for Q#2 and Q#3.



A normal DC motor is fitted with a circular disc on its shaft as shown on the left. The other side of the disc has a pattern as shown on the right. Three IR sensors are fixed in such a way that each of them reads a specific position on the disc all the time. [Note: each sensor reads 0 on the black and 1 otherwise. IR sensor 0 represent LSB].

Assuming that the disc is rotating clockwise as shown by the arrow.

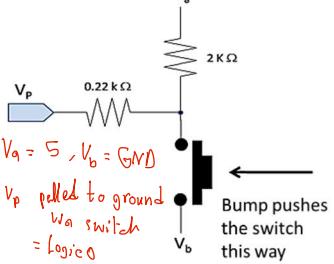
2	At the start of an experiment, the sensors read 000. After 500ms, the reading was 100. The disc has <u>at least</u> moved approximately _____ degrees. (a) 90 (b) 245 (c) 180 (d) None of these	C $\frac{4}{8} \times 360 = 180^\circ$
3	In another experiment it was observed that the reading 000 appears after <u>every 1 second</u> . Based on this information, one can calculate the RPM for this motor as _____ (a) 60 (b) 1 (c) 120 (d) None of these [Note: RPM=revolutions per minute]	A $2 \text{ revolution per second} = 60 \text{ RPM}$



A LIDAR pattern is shown in the figure on right. Assuming a robotic car has it on top of its roof and is scanning the road in front of it. Use this for Q#4 and Q#5.

4	Assuming the pattern received at a specific time is shown in the figure on the left as well. Most probably there is an <u>obstacle</u> at: (a) a to b (b) b to c (c) c to d (d) None of the above	B
5	The robot most probably should move in the path defined by: (a) a to b (b) b to c (c) c to d (d) None of the above	C

The robot should move along the clearest path.

6	A color sensor can be made by using an LDR with three basic color LEDs around it so that the reflection received from the surface in front of the LDR. Suppose the red LED goes bad. The following color will not be distinguished easily: <i>red reflection weak</i>  (a) Green (b) Blue (c) Yellow (d) None of these		C
7	<i>by echo time</i> An Ultrasonic sensor 	is an example of a device that can measure (a) distance Only (b) speed Only (c) both distance and speed (d) None of these.	A
8	A suitable sensor to continuously monitor the speed of a mobile robot could be: (a) Compass Sensor (b) restricted rotation potentiometer (c) a DC Motor (d) None of these.	<i>can provide speed back</i>	C
9	Following sensor Can Not be used as obstacle detector for the mobile bot: (a) Ping sensor (b) Bumpers (c) IR Sensor (d) None of these.	All	D All <i>All can be used for obstacle detection</i>
10	Consider a bump switch on a mobile robot as shown in the following circuit:  If $V_a = 5$ volts and $V_b = \text{Ground}$ , then the Port voltage $V_p$ should be read as Logic _____ when the robot bumps into an obstacle. (a) 0 (b) 1 (c) not defined (d) None of these.	 <i>Va = 5, Vb = GND</i> <i>Vp pulled to ground</i> <i>Wa switch = Logic 0</i> <i>Bump pushes the switch this way</i>	A
11	Repeat Q#10 for $V_a = \text{GND}$ volts and $V_b = 5$ volts. (a) 0 (b) 1 (c) not defined (d) None of these.	<i>Vp pulled to 5V via switch</i>	B
12	Following does NOT happen when the first pulse is given to the Ultrasonic sensor: (a) starts the pulse whose width corresponds to the obstacle distance (b) starts the ultrasonic burst (c) starts a timer the sensor (d) None of these.	<i>this happens after the echo</i>	A
13	A typical GPS receiver sends the following Signal to the satellite: (a) Its coordinates (b) Its Interrupt status (c) Its battery status (d) None of these.	<i>Receive Data From Satellite</i>	D Rec.
14	A MEMS system can Not be used for implementing the following sensor: (a) Gyroscope (b) Accelerometer (c) Electro-mechanical Compass (d) None of these.	<i>not part of MEMS</i>	C
15	Following is Not a reason to use Wheel Encoding patterns: (a) Speed measurement (b) Wheel's Direction of motion (c) Alignment of wheels (d) None of these.	<i>because it does not measure Alignment</i>	C
16	Following is NOT a heading sensor that can be used with a mobile robot for in-class activities: (a) compass (b) ultrasonic sensor (c) GPS (d) None of these	<i>is not suitable, compass is better</i>	C