

Autonomous Driving Capstone Design Final Exam

Time: 3:00 PM – 3:30 PM

Score: _____ / 180

Exam Questions: (1) – (18)

Name:

Student ID:

Exam Location: Room

330102

"Select all that apply" questions may have multiple correct answers. (There may also be only one correct answer.)

1. **(10 points)** What is the name of the website used for labeling image data introduced in this class?

Answer (_____)

① roboflow ② Kaggle ③ github ④ colab ⑤ labelme

2. **(10 points)** Select a sensor that rotates 360 degrees while emitting a laser, measures the time it takes for the laser to reflect back, and calculates the distance to an object.

Answer (_____)

① Camera ② LiDAR ③ Ultrasonic sensor ④ GPS ⑤ Encoder

3. **(10 points)** Select the most appropriate command to verify whether a camera or sensor such as an Arduino connected to Linux is recognized as a device.

Answer (_____)

① lsmod ② ifconfig ③ ls /dev ④ chmod ⑤ df

4. (10 points) What is the build system used in ROS2?

Answer (_____)

- ① catkin ② callin ③ colcon ④ collon ⑤ make

5. (10 points) Which of the following is NOT a correct description of the HSV color space?

Answer (_____)

- ① One of the methods for expressing color, based on hue, saturation, and value.
- ② The HSV color space can be used to detect traffic light colors.
- ③ The HSV color space can be represented as a cylindrical model.
- ④ In the HSV color space, the brightness component is not expressed separately.

6. (10 points) In the ROS 2 environment, what command must be executed first to use ROS 2-related commands (such as `ros2 run`, `ros2 topic`, etc.) in the terminal (shell)?

Answer (_____)

- ① `ros2 install`
- ② `colcon build`
- ③ `chmod +x ros2`
- ④ `source /opt/ros/humble/setup.bash`

7. (10 points) Select all correct statements about ROS 2 topic communication.

Answer (_____)

- ① A single Topic message channel supports one-way communication between nodes.
- ② A Topic provides information to the publisher node about whether the subscriber node has successfully received the message.
- ③ A Topic message published by one node can be received by multiple nodes.
- ④ A publisher and a subscriber must share the same topic name and message type to communicate.

8. **(10 points)** Select the **incorrect** description of the perception–decision–control structure (Modular Architecture) in an autonomous driving system.

Correct answer (_____)

- ① The perception module interprets the driving environment and recognizes objects based on sensor data.
- ② The decision module plans routes and performs driving decisions based on the recognized information.
- ③ The control module controls steering, acceleration, and braking based on the planned path and driving objectives.
- ④ The control module directly receives sensor data to classify road objects and predict hazards.
- ⑤ The perception–decision–control structure is modularized, enabling easier development and debugging.

9. **(10 points)** Which of the following statements **is inappropriate**?

Correct answer (_____)

- ① The Vim editor has a command mode and an input mode.
- ② The Vim editor is a GUI (Graphical User Interface).
- ③ The Vim editor is a CLI (Command Line Interface).
- ④ The Vim editor can perform file editing, saving, and exiting using keyboard commands.

10. **(10 points)** Which of the following **is not** a function provided by an operating system to users?

Answer (_____)

- ① Providing an interface for running programs
- ② File storage and access functionality
- ③ Efficient management of hardware resources
- ④ Supplying power and controlling physical device currents
- ⑤ Supports a multitasking environment

11. (10 points) **Select all of** the correct explanations regarding the essential role of ROS 2 and its relationship with the operating system.

Correct answer (_____)

- ① ROS 2 provides message-based communication functionality for robot application development.
- ② ROS 2 can run on various operating systems and utilizes the various functions provided by the operating system.
- ③ ROS 2 is a type of operating system that directly controls hardware resources.
- ④. ROS 2 is a software framework that supports communication between nodes and distributed processing.

12. (10 points) **Select all correct descriptions** of situations that may occur after installing Windows and Ubuntu in a dual-boot configuration.

Answer (_____)

- ① A menu allowing you to select the operating system may appear when you turn on the computer.
- ② Even if Ubuntu is installed, if the boot priority in BIOS/UEFI is set to Windows, the computer may boot directly into Windows.
- ③ If you install Ubuntu using a bootable USB drive, you must set the USB drive as the boot priority in the BIOS/UEFI settings for the installation to proceed.
- ④ During Ubuntu installation, there may be a process to partition the disk or designate existing space separately.

13. (10 points) **Select all** the correct statements from the following.

Answer (_____)

- ① The `ros2 run` command is used to run a single node.
- ② The `ros2 launch` command can be used to run multiple nodes simultaneously.
- ③ The `ros2 topic list` command displays a list of currently running topics.
- ④ The `ros2 topic echo` command is used to publish topic messages.
- ⑤ The `ros2 topic echo <topic name>` command outputs the message of the specified topic in real time.

14. (10 points) Select all the correct statements.

Answer (_____)

- ① The Arduino and laptop PC provided in this class can exchange information via serial communication.
- ② Spline interpolation can be used to plan smooth paths.
- ③ When using the ROS 2 system, the two rear wheels must receive the same speed commands.
- ④ The yolov8_node provided in this class is responsible for road environment learning.
- ⑤ Determining what lanes are within the camera image frame is part of the decision-making component of autonomous driving.

15. (10 points) Select all of the following that are appropriate characteristics or examples of Physical AI.

Correct answer (_____)

- ① A system in which autonomous vehicles use cameras and LiDAR sensors to determine their route in real time and control the vehicle
- ② A system where AI-based robots recognize the work environment and perform assembly tasks within a factory
- ③ An AI-powered conversational system that analyzes users' questions in text and provides responses
- ④ A system where drones analyze video data to track people and adjust flight paths
- ⑤ A system where smart robot vacuum cleaners map spaces and perform cleaning tasks while avoiding obstacles

16. (10 points) Select all correct answers from the following descriptions.

Correct answer (_____)

- ① The terminator provides convenience to users through screen splitting functionality.
- ② Terminator is not included in the default terminal and must be installed separately for use.
- ③ When a new terminal window is opened, .bashrc is automatically executed.
- ④ .bashrc can be used to automatically apply commands such as ROS 2 environment settings.

17. (10 points) Select all the correct statements from the following.

Answer (_____)

- ① An SMPS can convert alternating current (AC) to direct current (DC).
- ② A variable resistor is an electronic component whose resistance value changes depending on how much the knob is turned.
- ③ By changing the jumper wire configuration connected to the Arduino without modifying the software, you can change the rotation direction of the DC motor.
- ④ An ultrasonic sensor calculates distance by measuring the time it takes for a laser beam to reflect off an object.

18. (10 points) In the code provided in this class, what is the ROS 2 package that contains the data types (e.g., int, str, float, etc.) of the topic information published by the nodes?

Answer (_____)

- ① camera_perception_pkg
- ② lidar_perception_pkg
- ③ decision_making_pkg
- ④ interfaces_pkg
- ⑤ debug_pkg