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COE312 –

**The quiz open book and notes and you can use the Internet. You are not allowed to consult other individuals or your classmates.**

PLEASE UPLOAD YOUR ANSWER USING THIS **WORD** FILE. DO NOT UPLOAD ANY ZIPPED OR PDF FILE. ONE WORD FILE ONLY.

The question(s) have been written in a manner such that it is not possible for two students to have the same solution. Therefore, please refrain from the temptation of copying code and changing order of and names of variables, etc. AUS code of conduct will be strictly enforced, and no violation will be tolerated as per AUS policy. Please note that the AUS code does not discriminate between who copied from whom so it is not advisable to share your solution.

**Q1. (20 points)** A spacecraft dynamically adjusts its **engine throttle state** by processing input from multiple sensors. Each sensor generates a random integer between 0 and 10 and transmits the value to the spacecraft at a regular interval of **1 second**. Every **5 seconds**, the spacecraft analyzes the latest **10** received sensor values to determine the **mode** (the value that occurs most frequently), which represents the prevailing engine power level. If the mode equals or surpasses **5**, the spacecraft transitions into **HalfThrottle state**, indicating a reduced power output. Conversely, if the mode falls below **5**, the throttle state switches to **FullThrottle**, indicating maximum power utilization.

Use appropriate design patterns to implement the above scenario. Synchronize the shared resources where required.

You must run and provide output on the following program (without any changes to the program). You are not allowed to make any changes to this program. **Ensure that your output closely aligns with the expected output in terms of content and length.**

public class Main {

public static void main(String[] args) {

Spacecraft spacecraft = new Spacecraft();

// simulating 10 sensors

for (int i = 0; i < 10; i++) {

new Sensor().registerObserver(spacecraft);

}

}

}

**Expected Output:**

Engine Power: 0

Transitioning to FullThrottle 🚀

Engine on Full Throttle

Engine Power: 5

Transitioning to HalfThrottle

Engine on Half Throttle

Engine Power: 6

Engine on Half Throttle

Engine Power: 4

Transitioning to FullThrottle 🚀

Engine on Full Throttle

Engine Power: 8

Transitioning to HalfThrottle

Engine on Half Throttle

Engine Power: 9

Engine on Half Throttle

Please provide 1) formatted code and 2) screenshots of your running program. Not providing a screenshot (with or without errors) will limit your score to below 3/10.

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| **Solution: (Paste formatted code in this box).** |

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| **Solution: (Paste the screenshot in this box).** |

**Grading Rubric:**

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| --- | --- | --- | --- |
| **0-3** | **4-6** | **7-8** | **9-10** |
| * The program does not compile or run but there is some notion of a solution OR * No screenshot is provided. | * Some of the program works but not fully. * Bad design practices have been used. | * The program partially matches the output provided. * Clean design practices have been followed. | * The program exactly matches the output. * Clean design practices have been followed. |