

Embedded Systems Midterm 2022

(Dr. Basem Ibraheem)

1. Write 4 Statements about each of the following: [5 points]

- ✓ - Characteristics of Embedded Systems
- ✓ - Metrics of Embedded Systems
- ✓ - MicroControllers vs MicroProcessors
- CISC vs RISC

2. Design question for a traffic lights system at a 4-way intersection. Similar to the one in the lecture but the 2 roads are bidirectional. The traffic lights should operate so that no collisions happen. All the traffic lights should be red before any of them turns green to make sure the intersection is clear of cars. Cars can always turn to their right regardless of the traffic lights, but going straight or to the left is controlled by the traffic lights. Traffic Light stays green for 60 seconds and amber for 5 seconds. [15 points]

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Decide the number and location of the required traffic lights to maximize the flow of the cars. **(Answer: 4 traffic lights are needed)**

- a. Draw a FSM representation of the system. [5 points]
- b. Draw a timing diagram of the system [5 points]
- c. Draw a Petri net representation of the system and its coverability tree. [5 points]



3. Draw the Schematic Wiring Diagram for the previous problem using Arduino Uno, Voltage Regulator 7805, 12V DC Power Source, LDR (Light Dependant Resistor), Red, Green, Amber LEDs. You may use any other components if needed.

Fading of LEDs should change according to day/night [5 points]

[There were given simple datasheet for LDR and for 7805 Voltage Regulator]