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| --- | --- | --- | --- | --- |
| AIUB | **American International University - Bangladesh (AIUB)**  **Faculty of Engineering**  **Department of Electrical and Electronic Engineering (EEE)** | | | |
| **Course Name:** | Microprocessor and Embedded Systems | **Course Code:** | EEE 4103 | |
| **Semester:** | Spring 2023-24 | **Term:** | Mid | |
| **Faculty Name:** | Protik Parvez Sheikh | **Assignment #:** | | 01 |

**Course Outcome Mapping with Questions**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **COs** | **POIs** | **K** | **P** | **A** | **Marks** | **Obtained Marks** |
| **Q1** | **CO2** | **P.a.4.C3** | **K4** | **P1, P3, P7** |  | **10** |  |
| **Total:** | | | | | | **10** |  |

**Student Information:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Due Date:** | **22/02/2024** | **Submission Date:** | |  | |
| **Student Name:** |  | | | | |
| **Student ID #:** |  | **Department:** |  | **Section:** | **E** |

**Marking Rubrics (to be filled by Faculty):**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Problem #** | **Excellent**  **[9-10]** | **Proficient**  **[7-8]** | **Good**  **[4-6]** | **Acceptable**  **[2-3]** | **Unacceptable**  **[1]** | **No Response**  **[0]** | **Secured Marks** |
| Detailed unique response explaining the concept properly and answer is correct with all works clearly shown. | Response with no apparent errors and the answer is correct, but explanation is not adequate/unique. | Response shows understanding of the problem, but the final answer may not be correct | Partial problem is solved; response indicates part of the problem was not understood clearly or not solved. | Unable to clarify the understanding of the problem and method of the problem solving was not correct | No Response/ copied from others/identical submissions with gross errors/image file printed |
| **Comments** |  | | | | | **Total Marks (10)** |  |

**Question # 1:** Complete Table 1 after going through the datasheet of the specified microcontrollers.

**Table 1**

| **Specifications** | **ATMega328P** | **STM32F401RE** | **ATMega2560** | **PIC24FJ64GA004** |
| --- | --- | --- | --- | --- |
| **Architecture Type** |  |  |  |  |
| **Maximum Clock Speed** |  |  |  |  |
| **Program Flash Memory (Kbytes)** |  |  |  |  |
| **SRAM (Kbytes)** |  |  |  |  |
| **ADC Resolution** |  |  |  |  |
| **Operating Voltage Range (V)** |  |  |  |  |
| **Number of PWM Channels** |  |  |  |  |
| **Communication Interfaces** |  |  |  |  |

The unit prices of the above mentioned MCUs are as follows: (1 USD = 124 BDT)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **ATMega328P** | **STM32F401RE** | **STM32F412ZGT6** | **ATMega2560** | **PIC24FJ64GA004** |
| **Price** | $3.70 | $4.22 | $6.00 | $15.28 | $4.53 |

X Company in Bangladesh is trying to develop an affordable shop security system and they have shortlisted the listed 5 MCUs as possible candidates for their system CPU. The required minimum specifications for their intended design for the CPU are given below:

|  |  |
| --- | --- |
| **Minimum Clock Speed** | 32 MHz |
| **Minimum SRAM** | 8 Kbytes |
| **Minimum ADC Resolution** | 10-bit |
| **Minimum Program Memory** | 32 KBytes |
| **Minimum Number of PWM Channels** | 6 |
| **Required Serial Communication Interfaces** | SPI, TWI, USART |

Being a design engineer at X Company, you have been given the responsibility to select the most suitable IC from the list for the security system design.

Please select an IC from the list to design an affordable and efficient system and justify your answer with proper reasoning.