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 2022-23	**Term:**	Mid
Faculty Name:	Md. Ali Noor	**Assignment #:**	01/02

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:	**20**	

Student Information:

Student Name:	**Md. Sumon**	**Section:**	**A**
Student ID #:	**20-42556-1**	**Department:**	**CSE**

Submission Information:

Submission Date:	**16/02/2023**	**Due Date:**	**16/02/2023**
Student ID #:	**20-42556-1**	**Department:**	**CSE**

Marking Rubrics (to be filled by Faculty):

Problem #	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	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.	Unable to clarify the understanding of the problem and method of the problem solving was not correct	No Response/ (Copied/identical submissions will be graded as 0 for all parties concerned)	
StudentID							
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 = 106.40 BDT)

	ATMega328P	**STM32F401RE**	**ATMega2560**	**PIC24FJ64GA004**
Price	$2.70	$4.10	$18.86	$4.02

X Company in Bangladesh is trying to develop an affordable shop security system and they have shortlisted the listed 4 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	16 MHz
Minimum SRAM	8 Kbytes
Minimum ADC Resolution	10-bit
Minimum Program Memory	32 Kbytes
Minimum Number of PWM Channels	5

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.

Solution:

Specifications	ATMega328P	STM32F401RE	ATMega2560	PIC24FJ64GA004
Architecture Type	AVR enhanced RISC	ARM®Cortex® - M4 32-bit RISC core	AVR enhanced RISC	Modified Harvard Architecture
Maximum Clock Speed	20 MHz	84 MHz	16 MHz	32 MHz
Program Flash Memory (Kbytes)	32 Kbytes	512 Kbytes	256 Kbytes	64 Kbytes
SRAM (Kbytes)	2 Kbytes	96 Kbytes	8 Kbytes	8 Kbytes
ADC Resolution	10-bit	12-bit	16-bit	10-bit
Operating Voltage Range (V)	1.8V-5.5V	1.7V-3.6V	7.0V-12V	2.75-3.6V
Number of PWM Channels	6	4	12	5
Communication Interfaces	Serial Communication Interfaces	12 Communication Interfaces (Up to three I2Cs, up to four SPIs, Two full duplex I2Ss, and Three USARTs)	TXCn Flag is useful in half-duplex communication interfaces (like the RS-485 standard)	Serial Communication Interfaces

As a design engineer at X Company, I would select **PIC24FJ64GA004** the most suitable, affordable, and efficient system IC for the security system design.
The specifications of **PIC24FJ64GA004** IC are given below which match the required minimum specifications for their intended design for the CPU:

Minimum Clock Speed	32 MHz
Minimum SRAM	8 Kbytes
Minimum ADC Resolution	10-bit
Minimum Program Memory	64 Kbytes
Minimum Number of PWM Channels	5

Here Given,
PIC24FJ64GA004 IC price is $4.02.
1 USD = 106.40 BDT
So, in BDT, the price of this IC would be
= (4.02*106.40) BDT

= 427.73BDT

The price is affordable for the company and for these specifications, this would be an efficient system for security system.