Date: 05/11/2020

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department of Computer Science and Engineering
Program: B.Sc. in Computer Science and Engineering
Semester Final Examination, Fall-2019

Part A

Year: 3rd **Course No: CSE3215**

Semester: 2nd **Course Name: Microcontroller Based System Design**

Time: 2 (Two) hours **Full marks: 40**

Use Single answer script

Instructions:	i)	Answer script should be hand written and should be written in A4 white paper. You must submit the hard copy of this answer script to the Department when the university reopens.
	ii)	Write down Student ID, Course number, and put your signature on top of every single page of the answer script
	iii)	Write down page number at the bottom of every page of the answer script.
	iv)	Upload the scan copy of your answer script in PDF format at the respective site of the course at **google classroom** using institutional email within the allocated time. Uploading clear and readable scan copy is your responsibility and must be covered the full page of your answer script.
	v)	You must avoid **plagiarism,** maintain **academic integrity, and ethics**. You are not allowed to take any help from another individual and if taken so can result in stern disciplinary actions from the university authority

Part A

Instructions:	i)	Before uploading rename the PDF file as **CourseNo_StudentID_PartNo** e.g.CSE3215_180107001_partA.pdf
	ii)	There are **5 (Five) Questions, Answer any 4 (Four)**
	iii)	Marks allotted are indicated in the **right margin**
	iv)	Necessary **charts/tables** are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]

a) What do you know about Embedded Systems? Write down the characteristics of embedded systems and give some examples of embedded systems which are commonly used in our home and office. **[5]**

b) Explain how 8051 handles an interrupt. Discuss what happens if interrupts INTO, TFO, and INT1 are activated at the same time. **[5]**

Question 2. [Marks: 10]

a) Distinguish between a microprocessor and a microcontroller. **[5]**

b) Explain how LCALL works. Analyze the stack for the LCALL instructions in the following program. **[5]**

0000		ORG	0
0000	7455	BACK:	MOV A,#55H
…….	F590		MOV P1,AFB
…….	FB22		MOV R3,#22H
…….	7A25		MOV R2,#25H
…….	120200		LCALL DELAY
…….	74AA		MOV A,#0AAH
…….	F590		MOV P1,A
…….	120200		LCALL DELAY
…….	80EC		SJMP BACK
0200		0RG	200H
…….	C003	DELAY:	PUSH 3
…….	C002		PUSH 2
…….	7BFF		MOV R3, 0FFH
…….	7AFF	NEXT:	MOV R2, 0FFH
…….	DAFE	AGAIN:	DJNZ R2, AGAIN
…….	DBFA		DJNZ R3, NEXT
…….	D002		POP2

…….	D003		POP3
…….	22		RET
…….			END

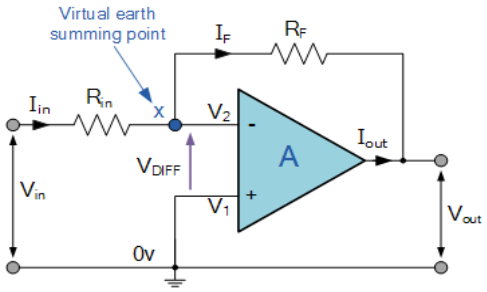
Question 3. [Marks: 10]

a) Write down the function of each bit of AVR status register. Let R20 contains 11101101, write the instructions to clear bits 2,3 and 6 regardless of their previous values. After that store bit 4 from R20 to the T flag and show the contents of T flag and R20. **[2+3]**

b) Write down the five basic characteristics of the sensors. **[2+3]**
Suppose, we want to detect the speed of a black car coming fast towards a white wall. A sensor is placed in the wall which will trigger an alarm when the car comes near 100m of the white wall. Considering the situation, which sensor will be appropriate, ultrasonic or infrared? Explain your answer.

Question 4. [Marks: 10]

a) For a summing amplifier, let R1=R2=R3= 100 KΩ and Rf = 33 KΩ. If V1=+5V, V2=+5V and V3= -1V, find Vo. **[2+3]**



For the above figure, let RF = 350kΩ, Rin = 20kΩ and Vin = -0.75V.
Calculate I, the voltage across RF and Vo.

b) Explain the working principle of the sonar sensor. A sonar sensor is showing 710m distance as output in air where speed of sound is 344 m/s. Calculate the time needed for the generated sound wave to hit the obstacle. If the same sensor gives same distance reading underwater within 760.65 milliseconds, then what is the speed of sound underwater? **[5]**

Question 5. [Marks: 10]

a) In the SPI communication System, a Master device is connected with 4 other Slave devices. There is a separate Slave select line for each Slave device which is active low. Whenever the master sends the character 'B'(0x42) to any of the slaves, the slave returns its ID as a response. ID numbers are as following: '1'(0x31), '2'(0x32), '3'(0x33), '4'(0x34). **[7]**
Draw the circuit diagram as well as the timing diagram consisting of all necessary signal lines for Master to communicate with the slave having ID: '2'.

b) Explain the working procedure of UART. **[3]**

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Semester Final Examination, Fall-2019

Part-B (Open book exam)

Year: 3rd **Course No: CSE3215**

Semester: 2nd **Course Name: Microcontroller Based System Design**

Submission deadline: Next day 6.30 pm **Full marks: 20**

Use Single answer script

Instructions:	i)	Before uploading rename the PDF file as **CourseNo_StudentID_PartNo** e.g.CSE2207_180107001_partB.pdf
	ii)	**Answer all the Questions**
	iii)	Marks allotted are indicated in the **right margin**
	iv)	Necessary **charts/tables** are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]

a) Design a smart room following the instructions below: **[8]**

1. For entering the room, you have to enter the password "#124" on the keypad. Connect the keypad starting from pin P.
2. Fan will start moving when the temperature is above Q° and the speed will increase along with the temperature.
3. Fan will start moving in the opposite direction when the temperature is below Q° and the speed will decrease along with the temperature decreases.

Where,

- **P = Your Roll % 47**
- **Q = (Your Roll % 10) + 20**

Instructions:

* Keypad pins will be P, P+1, P+2, P+3, P+4, P+5, P+6
* You must show the detail calculation of **P & Q** when you will begin your answer for "**question1.a**".

b) Which function is used to get-key value during a 4x4 keyboard interfacing? **[2]**

Question 2. [Marks: 10]

a) Design a water level detection system using Sonar Sensor, LCD and water pump. **[7]**
let's assume the tank is 25cm high,

- if the distance measured by the sensor is >= 15cm, then the water pump will be on and continue until the distance becomes 4cm.
- LCD display will show the water level with a 5-second delay.

b) How important teamwork is to build a successful project? Was teamwork beneficial or detrimental to develop your final MSD project? Explain the reasons. **[3]**