

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department: Computer Science and Engineering
Program: B.Sc. in Computer Science and Engineering
Semester Final Examination: Spring 2020
Year: 3rd Semester: 2nd
Course Number: CSE3215
Course Name: Microcontroller Based System Design

Time: 3 (Three) Hours

Full Marks: 60

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)	You must write the following information at the top page of each answer script: Department: Course no: Examination: Student ID: Program: Course Title: Semester (Session): Signature and Date:
	iii)	Write down Student ID, Course number and put your signature on top of every single page of the answer script.
	iv)	Write down page number at the bottom of every page of the answer script.
	v)	Upload the scan copy of your answer script in PDF format through provided google form at the respective course site (i.e., google classroom) using institutional email within the allocated time. Uploading clear and readable scan copy (uncorrupted) is your responsibility and you must cover all the pages of your answer script. However, for clear and readable scan copy of the answer script student should use only one side of a page for answering the questions.
	vi)	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.
	vii)	Marks allotted are indicated in the right margin .
	viii)	Necessary charts/tables are attached at the end of the question paper. You may use graph papers where necessary.
	ix)	Assume any reasonable data if needed.
	x)	Symbols and characters have their usual meaning.
	xi)	Before uploading, rename the PDF file as CourseNo_StudentID.pdf e.g., CSE3101_180104001.pdf

The answer script (**one single PDF file**) must be uploaded at designated location in the provided **Google Form link** available in the Google classroom.

There are 7 (Seven) Questions. Answer any 5(Five).

Question 1. [Marks: 12]		
a)	Discuss the importance of using embedded systems in our day-to-day life. N.B: explain with two or three real-life examples.	[3]
b)	Distinguish between a microcontroller and a microprocessor.	[4]
c)	Write an assembly program which will move 55H, 56H and 57H into R1, R2 and R3 registers of Bank1; move 2H and 4H into the R0 and R2 registers of Bank3. After executing the above program show the contents of the RAM locations. Then write PUSH instructions to push the contents of the registers on the stack and show the contents of it.	[5]
Question 2. [Marks: 12]		
a)	Find the data memory size of ATmega128 and ATmega2560, where the extended I/O is 110 and 410, SRAM size is 4096 and 8192 respectively.	[3]
b)	What are the advantages of IN instruction over the LDS instruction? Find the ROM memory address, on-chip ROM in bytes and ROM organization of each of the following AVR chips: ATtiny32 ATmega643	[4]
c)	What is a Real-time system? There are two types of real-time systems, explain each of them with examples.	[5]
Question 3. [Marks: 12]		
a)	Write short notes on AVR data memory.	[2]
b)	What will be the value of SREG in AVR microcontroller after executing the following instructions? LDI R20, 60 LDI R21, 30 ADD R20, R21 BST R20, 4 N.B: Consider the value of the Global Interrupt Enable is 1.	[4]
c)	What is the work of status register in a Microcontroller? Explain its contents (for 8051 and AVR).	[6]
Question 4. [Marks: 12]		
a)	Voltage Follower is a special type of non-inverting amplifier. Suppose you have a non-inverting amplifier. Explain how you can make a voltage follower from it.	[3]
b)	What is Offset Null? What is the use of the Offset Null pins in the operational amplifier IC?	[4]

c)	Draw the circuit diagram of a Summing Amplifier, then put the values of $I_1=5\text{ mA}$, $I_2=10\text{mA}$, $R_1=2\text{K}\Omega$, $R_2=5\text{K}\Omega$, $R_3=10\text{K}\Omega$ and $V_3=10\text{V}$. Find V_1 , V_2 , I_3 and V_{out} where feedback resistance is $250\text{K}\Omega$.	[5]
Question 5. [Marks: 12]		
a)	Make a Lamp Post (Design and Code) with LED and LDR which turns on at night and turns off at day time.	[6]
b)	What is active and passive sensor? Explain the characteristics of sensors.	[6]
Question 6. [Marks: 12]		
a)	Explain the advantages of I2C over UART and SPI.	[4]
b)	SPI can control multiple slaves in two different ways. Now explain how SPI does these.	[4]
c)	Show the steps of the UART communication.	[4]
Question 7. [Marks: 12]		
a)	Compare the erasing process of EPROM and EEPROM.	[3]
b)	Out of sonar sensor and IR sensor, which one is more accurate for measuring distance? A sonar sensor is showing 1200m distance as output in the 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 1500 milliseconds, then what is the speed of sound in underwater?	[4]
c)	Write short notes on the Motor Driver IC L293D and Relay.	[5]