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PRESIDENCY UNIVERSITY BENGALURU

**SET-B**

SCHOOL OF ENGINEERING

**END TERM EXAMINATION - MAY /JUNE 2024**

**Semester :** Semester VI - 2021

**Course Code :** ECE3014

**Course Name :** Microcontroller Applications

**Program :** B. Tech.

**Date :** June 12, 2024

**Time :** 1:00 PM - 4:00 PM

**Max Marks :** 100

**Weightage :** 50%

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

**PART A**

**ANSWER ANY FIVE QUESTIONS (5 Q X 2 M = 10 M)**

* 1. The amount of RAM and ROM on chip is one of the criteria for choosing a microcontroller. What is the difference between byte addressable memory and bit addressable memory? [2MARKS]

(CO1) [Knowledge]

* 1. Machine cycle refers to a sequence of steps that a computer's central processing unit (CPU) goes through in order to execute a single machine language instruction. Name the instruction used to waste the clock cycles and how many machine cycles are taken for the execution for the same. [2MARKS]

(CO2) [Knowledge]

* 1. The 8051 has two timers/counters. They can be used either as timers to generate a time delay or as counters to count events happening outside the microcontroller. Draw the TMOD register and define all it’s bits? [2MARKS]

(CO3) [Knowledge]

* 1. Baud rate decides the bit rate in Serial communication. What will be the Baud rate when SMOD bit in PCON register is equal to 1. [2MARKS]

(CO3) [Knowledge]

* 1. ARM is a family of RISC instruction set architectures (ISAs) for computer processors. ARM stands for

. It is a bit controller.

[2MARKS]

(CO4) [Knowledge]

* 1. Banked registers in ARM are available only when the processor is in particular mode. Name the banked registers used in Abort mode.

[2MARKS]

(CO4) [Knowledge]

* 1. Serial data transfer in 8051 is done at various baud rates. How can the baud rate of data transfer be doubled? [2MARKS]

(CO3) [Knowledge]

**PART B**

**ANSWER ANY FIVE QUESTIONS (5 Q X 10 M = 50 M)**

* 1. a) Assembler directives in 8051 assembly language are instructions that guide the assembler during the process of assembling. Discuss different assembler directives in 8051 microcontroller. [5MARKS]

b) With timing diagram, explain the signals used to access external ROM & RAM in 8051 based system [5MARKS]

(CO1) [Comprehension]

* 1. Assembly language programming is a hardware specific language. Write an ALP to perform the following and also show the steps to get the result.

[10MARKS]

(CO2) [Comprehension]

* 1. Serial communication can be controlled using two dedicated registers.
     1. Identify the two registers and explain the bit configuration of any one in detail. [5MARKS]
     2. Assuming a crystal frequency of 11.0592MHz Write a program to receive serial data and place it in internal RAM location 65H and also send it to Port 2. [5MARKS]

(CO3) [Comprehension]

* 1. In Intel 8051, there are two 16-bit timer registers. These registers are known as Timer0 andTimer1. The timer registers can be used in two modes. These modes areTimer mode and the Counter mode. The only difference between these two modes is the source for incrementing the timer registers. These registers are used for the serial communication of data. With XTAL = 11.0592 MHz, find the TH1 value needed to have the following baud rates. (a) 9600 (b) 2400 (c) 1200 [10MARKS]

(CO3) [Comprehension]

* 1. An embedded system is a dedicated system designed to perform one or two specific functions. Identify the key component used in the design of embedded system. Explain the 4 major design rules and also its design philosophy with relevant diagram. 10MARKS]

(CO4) [Comprehension]

* 1. The ARM Current Program Status Register (CPSR) controls the processor operating mode and enables switching between different modes in ARM cores. Draw the CPSR register and explain all the modes of ARM [10MARKS]

(CO4) [Comprehension]

* 1. In engineering, debugging is the process of finding the root cause of and workarounds and possible fixes for bugs. Many programming languages and software development tools also offer programs to aid in debugging. Debug the following program and write the corrected program.

MOV TMOD, #20H MOV TH1, #FDH MOV SCON, 40H SETB TR0

Repeat: CLR RI Wait: JNB TI, Wait

MOV A,SBUF MOV 62H, A MOV #P2, A

JMP Repeat

HLT [10MARKS]

(CO3) [Comprehension]

**PART C**

**ANSWER ANY TWO QUESTIONS (2Q X 20 M = 40 M)**

* 1. a) External Memory chips can be connected to 8051 Microcontroller through external buses. Design a Memory Address Map to interface 8051 Microcontroller with two 16KB ROMs and two 8KB RAM memory chips showing all possible connections. [15MARKS]

b) Controlling the flow of the program is one of the important aspects of program development. This is achieved by conditional and unconditional branching instruction like CALL and JUMP. Discuss the difference between JUMP and CALL instructions. [5MARKS]

(CO2, CO1) [Application]

* 1. a) Write an Assembly Level Program to generate a square wave with 70% duty cycle on P1.5 pin.

Timer 0 is used to generate the time delay. Assume XTAL = 11.0592 MHz

(10 MARKS)

b) Show the stack and stack pointer for each line of the following program. MOV R0,#66H

MOV R3,#7FH MOV R7,#5DH PUSH 0

PUSH 3

PUSH 7 CLR A MOV R3,A MOV R7,A POP 3

POP 7

POP 0

(10 MARKS)

(CO3, CO2) [Application]

* 1. a) Serial communication is preferred over parallel communication for the data transfer over long distance. Write a program for the 8051 to transfer “PRESIDENCY” serially at 9600 baud, 8-bit data, 1 stop bit, do this continuously. [10MARKS]

b) Processors with RISC architecture are faster as compared to their counterparts with CISC architecture. What mechanism does RISC processor use to do faster execution of instructions? Explain the same with relevant diagram [10MARKS]

(CO3, CO4) [Application]