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End Semester Examination, May 2025

Program Name: B.Tech Automotive Design Engineering   **Semester: IV**
Course Name: Microprocessor & Microcontroller   **Time: 3 hrs**
Course Code: ECEG-2066   **Max. Marks: 100**
Nos. of page(s): 4
Instructions: Assume any data in the design, if required.

SECTION-A (5Q x 4M = 20 Marks)

S.No		Marks	CO
Q.1	Define Embedded System. Discuss the difference between a microcontroller-based system and a microprocessor-based system with examples.	4	CO1
Q.2	Discuss the criteria to choose a microcontroller? Compare 8031, 8051, and 8052 microcontrollers.	4	CO2

Q.3	Calculate the delay for the following subroutine, if the system has an 8051 microcontroller with crystal frequency = 11.0592 MHz,
	    DELAY: MOV R2, # 100
	    HERE: MOV R3, # 225
	    AGAIN: DJNZ R3, AGAIN
	        DJNZ R2, HERE
	        RET
	Assume the machine cycles of MOV, DJNZ, and RET instructions are 1, 2, and 2. What technique can we apply to increase the delay in this subroutine?
		4	CO3

Q.4	Write a program to generate a square wave with 50 % and 75 % duty cycle on bit P1.5 with a delay of 100 ms for microcontroller operation.	4	CO4
Q.5	Write the assembly language program for the multiplication of two 8-bit numbers using 8085 microprocessor/ 8051 microcontroller using assembly language programming.	4	CO3

SECTION B (4Q x 10M = 40 Marks)

Attempt all the following

Q.6	Draw the pin diagram of the ATMEL 8051 microcontroller. Explain the need for pull-up registers and the dual role of Port 0 in 8051 microcontrollers	10	CO1
Q.7	Explain the use of line driver IC MAX-232 and DB-9 connectors used in serial communication and interface with the 8051 microcontroller. ***OR*** Detail and discuss the complete functional block diagram of the 8085 microprocessor with the description of all modules.	10	CO3

Q.8	**(a)** Calculate the time delay for the following subroutine with XTAL frequency 3 MHz for the 8085 microprocessor.
	
	      MVI B, 20H
	LOOP 1: MVI C, 98H
	LOOP 2: DCR C
	      JNZ LOOP2
	      DCR B
	      JNZ LOOP 1
	      RET
	MVI takes 7 T states, DCR 4 T states, JNZ 7/10 T states, and RET 10 T states.
	
	(b) Discuss the different types of addressing modes for the 8085 microprocessor with examples.
		5+5	**CO3**

Q.9	Detail the different types of instructions grouped for the 8085 microprocessor. Compare the following instructions based on their execution, T states, machine cycle, and examples **(a)** DAD and ADD **(b)** PUSH and POP **(c)** RAR and RLC **(d)** JNZ and JNC	**10**	**CO2**
**SECTION-C (2Q x 20M = 40 Marks)**
Attempt any *two* of the following
Q.10	**(a)** Comment on the functionality of the circuit given below. Write the Assembly language program or embedded 'C' code for alternately blinking the LED with a delay of 10 ms. **Fig.1**	**10+10**	**CO3**

SECTION-C (2Q x 20M = 40 Marks)

Attempt any *two* of the following

(b) For the circuit shown in Fig.2, two 4-bit parallel serial-out shift registers loaded with data are used to feed the data to a full adder. Initially, all the flip-flops are in a clear state. After applying two clock pulses, the output of the full adder should be S = 1 and $C_0 = 1$.
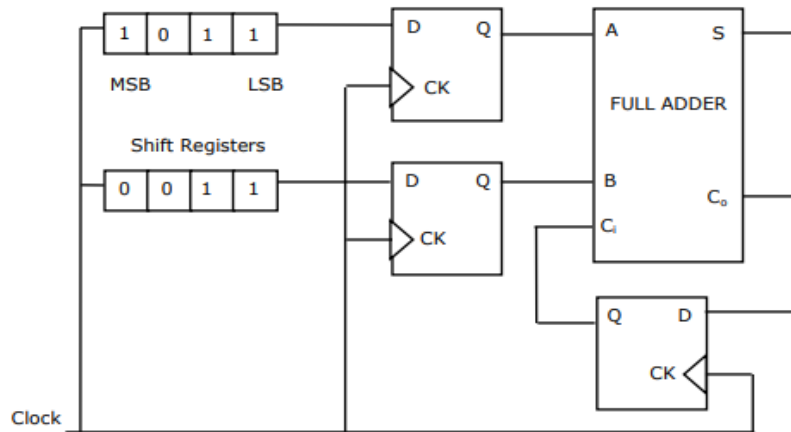

Fig.2

Now consider that the input register is 8-bit. Write the program in assembly or embedded 'C' for the shifting operations of the input data 00001011 in left and right operations for any microprocessor /microcontroller.

Q.11	(a) Calculate the time required to execute the instruction STA 9000 H, if the XTAL frequency is 3 MHz, also explain its timing diagram with the following data shown in Table 2. Table 2 STA instruction 	Address	Mnemonics	Opcode
800F	STA 9000 H	32
8010		00
8011		90 | (b) Draw and explain the block diagram (decoder circuit) and explain the generation of control signals. Also, write its corresponding truth table.	10+10	CO2
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Q.12	You are dealing with a simple system that can control 100 cars at the maximum. Each time a car enters, the microcontroller automatically adds it to the total sum of other cars found in the garage. Each car that comes out will automatically be taken off. When 100 cars park, a signal will turn on signaling that a garage is full and notifying other drivers not to enter because there is no space available. The signal from a sensor at the garage entrance sets bit IR200.00. This bit is a condition for the execution of the following two instructions in a program. The first instruction resets carry bit CY (it is always done before some other calculation that would influence	10+10	CO4

it), and the other instruction adds one to several cars in word HR00 and a total is again stored in HR00. HR memory space is selected for storing a total number of cars because this keeps the status even after the supply stops.
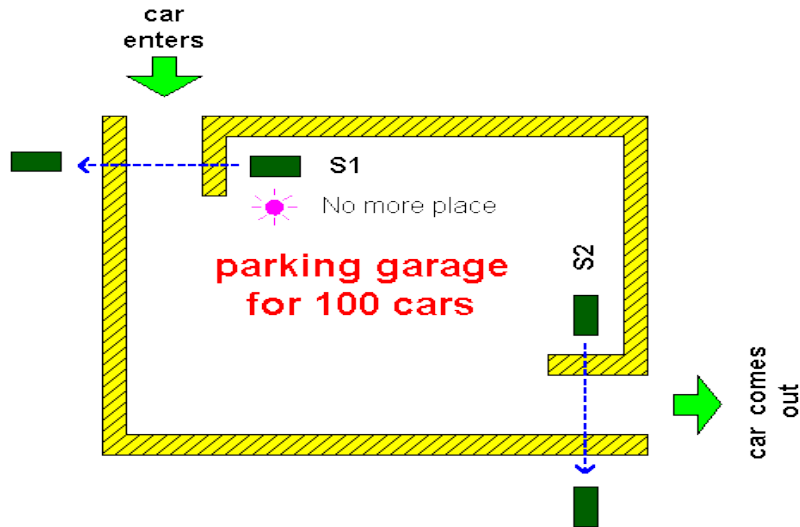

Fig. 1

(a) Develop a code to display the information of car parking on LCD (16 x 2). Use any microprocessor or microcontroller reference to develop the program
    (i)   FULL PARKING
    (ii)   VACANT PARKING

(b) Detail the all pins used in the LCD interface and show the complete interface diagram of the LCD to the microcontroller. Suggest the complete functional modules to support the problem.