Aliga N.S
B230155EC

Department of Electronics and Communication Engineering
National Institute of Technology Calicut
Mid Term Examination Monsoon 2024-25
EC2003E COMPUTER ARCHITECTURE AND PROCESSORS

Time:2Hrs **Max.Marks:30**

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1. Answer the following questions: **[1.5 x 4 = 6 Marks]**

   I. A new microprocessor follows the same naming conventions for its pins as the intel 8086 microprocessor. But the new microprocessor supports 4294967296 address slots. What should be the range of AD pins?

   (a) AD0-AD15 (b) AD0-AD19 (c) AD0-AD31 (d) AD0-AD25

   II. A processor has 40 distinct instructions and 24 general purpose registers. A 32-bit instruction word has an opcode, two register operands and an immediate operand. The maximum number of bits available for the immediate operand field is.....

   III. One memory chip of 2MB capacity has 16 data pins, 1Vcc pin, 1 Gnd pin, 1 enable pin and 1 R/w pin. Rest of the pins are address lines. What is the total number of pins of this chip?

   IV. How many bus cycles will be needed for the instruction: MOV AL, [2435H]

   (a) 1 (b) 2 (c) Instruction is invalid (d) Cannot be determined from the information provided

2. What is instruction queue in 8086? Briefly explain how it helps to improve the performance of the processor **[2 Marks]**

3. Briefly explain the functionality of Stack Pointer in 8086 **[2 Marks]**

4. Consider the following instruction of 8086

   MOV AL,10[BX]

   Now, assume that you are designing a new processor architecture which supports only Immediate, Direct and Register Indirect addressing modes. Write the instruction(s) which will perform the same functionality as the one above. **[2.5 Marks]**

5. Identify the addressing modes used in the following instructions **[3 Marks]**

   a. MOV AX, 0FH
   b. MOV [DI], AX
   c. MOV DI, [SI]
   d. MOV 0400H[BX], CX
   e. MOV AH,0400H[DI]
   f. MOV 200AH[BX][DI], AL

6. What will be the values of the specified register and flags after the execution of the following instructions? **[2.5 Marks]**

MOV AX,27A9H ; *Move the data to AX register*

SUB AX,329FH ; *Subtract contents of AX from the ~~data and~~ store the result in AX*
data from the content of AX

AX =? CF =?, ZF =?, AF =?, SF =?

7. The register content for an Intel 8086 microprocessor is as follows:

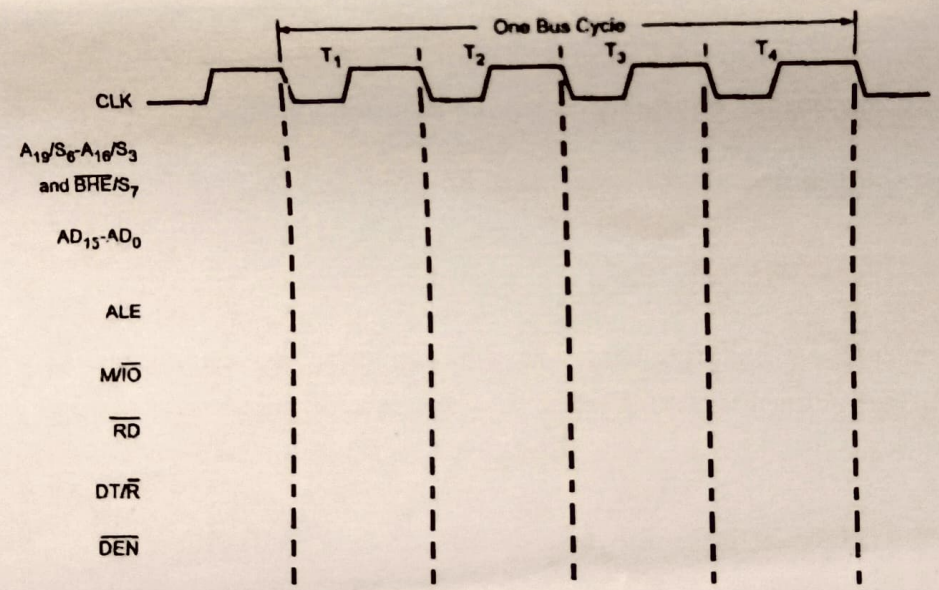
CS=2000H, DS=3000H, SS=4000H, SI=5000H, DI=6000H

BX=5060H, BP=7000H, AX=1845H, CX=5025H, DX=9965H.

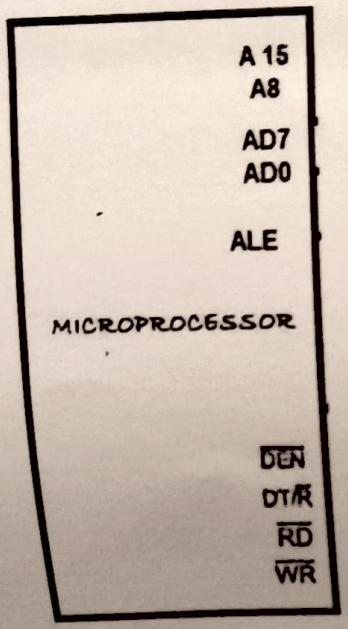
Calculate the physical address of the memory where the operand is stored and the contents of the memory locations in each of the instructions below **[4 Marks]**

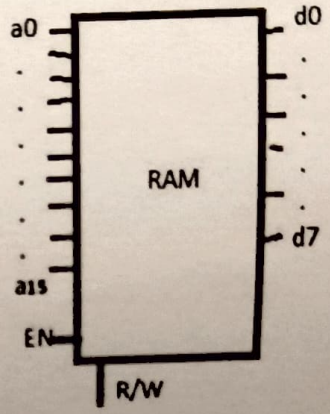
a) MOV [SI], BL
b) MOV 5H[DI], AX
c) MOV 6H[SI][BX], CX
d) MOV DX, 8H[BP][SI]

8. *Complete the timing diagram shown below related to 8086 minimum mode operation for read cycle* **[4 Marks]**



9. A memory device with 16 address lines and 8 data lines is to be interfaced to a microprocessor with 8 multiplexed address and data lines, and 8 dedicated address lines. The following figures give the line diagram of the components showing these buses along with the necessary control signals. Draw a detailed circuit diagram with brief explanations showing the connection between these devices. **[4 Marks]**





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NITC/EC/LR/AM/SLA/19/11/2025

Name : ....Arun.....
Roll No : ...b241079EC

NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
Department Of Electronics and Communication Engineering
III Semester B. Tech End Semester Examination
MONSOON Semester 2025- 2026

COMPUTER ARCHITECTURE AND PROCESSORS (Code: EC2003E)

Time: 180 Minutes

Maximum Marks: 40

(i) Answer all the questions.
(ii) Draw neat sketches wherever necessary.
(iii) Assume any missing data with proper justification

1.	In an 8051-based home security system, the door sensor is connected to P1.2, the window sensor to P1.3, and a siren to P2.0. Write an assembly language program to continuously monitor the door and window. If either sensor detects an open state, activate the siren by generating a square wave of a few hundred Hz.	3
2.	**MOV R0, #05H** **OUTER: MOV R1, #0FFH** **INNER: DJNZ R1, INNER** **DJNZ R0, OUTER** **NOP**	
(a)	Calculate the total execution time of this program segment.	1
(b)	If the crystal frequency is doubled to 24 MHz, how does the total delay change?	1
3 (a)	Write an assembly language program to generate a 15ms delay using Timer 0 in Mode 1 using 8051.	2
(b)	Timer 0 in 8051 is configured in Mode 1, but the programmer accidentally loads 50H in TL0 only, and forgets TH0. What delay will the timer generate?	1
4.	Assume that RAM locations 40-44 have the following values. Write a program using 8051 to find sum of the values. At the end of program, register A should contain low byte and R7 the high byte. All values are in hex **40=7D; 41=EB ; 42= C5; 43=5B ; 44=30**	2
5.	In the following instructions, if A contains random floating value, what will be the outcome of the program execution? **CJNE A, #00H, SKIP** **JMP HERE** **SKIP: JMP THERE**	1
6.	With XTAL = 11.0592 MHz, find the TH1 value needed to have the following baud rates. **(a) 9600 (b) 2400 and (c) 1200.**	3
7.	Write a program to transfer the message "YES" serially at 9600 baud, 8-bit data, 1 stop bit. Do this continuously.	2
8.	If register R3 currently holds 7AH, the following instructions are executed: **MOV A, R3**	

	RL A CPL A MOV R3, A	
(a)	Show the value of the accumulator A after each instruction.	1
(b)	Determine the final content of R3.	1
9	Explain IE register in 8051.	1.5
(a)	Show the instructions to enable the serial interrupt, Timer 0 interrupt, and external hardware interrupt 1 (EX1)	0.5
(b)	Show the instructions to disable (mask) the Timer 0 interrupt	0.5
(c)	show how to disable all the interrupts with a single instruction.	0.5
10	Write a program that continuously gets 8-bit data from P0 and sends it to P1 while simultaneously creating a square wave of 200 μs period on pin P2.1. Use Timer 0 to create the square wave. Assume that XTAL = 11.0592 MHz.	2
11	Develop a program to toggle the LED's after every 200 msec connected to P1.0 and P1.1 after receiving the external interrupt on INT0.	2
12	A student configures Mode 1, loads SBUF with a byte, but TI never becomes 1, so the data never transmits. What step could the student have overlooked?	1
13 (a)	Assuming that clock pulses are fed into pin T1 (P 3.5). Write a program for counter 1 in mode 2 to count the pulses and display the state of TL1 count on P2.	3
(b)	For 8051 XTAL=11.0592, Why? Explain	2
14 (a)	Illustrate the minimum mode operation of the 8086 microprocessor with a circuit diagram.	2
(b)	Draw and explain the **read machine cycle** of 8086 operating in minimum mode. Mention the function of the following signals during the cycle: **ALE, RD̄, M/IO̅, DEN̄, DT/R̄.**	2
(c)	(c) Briefly differentiate between the **read cycle** and **write cycle** of 8086 by highlighting changes in control signals.	2
15	An 8086-based embedded system designer plans to interface two 8-bit memory banks; one for the lower byte and one for the higher byte, to support efficient 16-bit data transfers.	
a	Explain why the designer uses separate HIGH and LOW memory banks and how this arrangement improves the speed of 16-bit memory accesses. Support with diagrams	2
b	Describe the role of **A0** and **BHE̅ (Bus High Enable)** signals in selecting memory banks for byte and word operations.	1

----------All the best----------