9. (a) Describe the direct addressing and register indirect addressing mode of 8051 with examples. What is the advantage of register indirect addressing mode?

   (b) Write two programs to copy the value 55H into RAM using register indirect addressing mode without and with a loop.

(3 + 3) + 6 = 12

MICROPROCESSORS, MICROCONTROLLERS & SYSTEMS (ECEN 3104)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i) Which bus is a bidirectional bus?
   (a) Address bus (b) Data bus
   (c) Address bus and Data bus (d) None of the above.

   (ii) A register in the microprocessor that keeps track of the answer or results of any arithmetic or logic operation is the?
   (a) Stack pointer (b) Program counter
   (c) Instruction pointer (d) Accumulator.

   (iii) When an error occurs in a program and an instruction needs to be eliminated it is more convenient to substitute the eliminated instruction with
   (a) HLT (b) Add 00H (c) NOP (d) RESET.

   (iv) The instruction OUT cannot send data from any register other than
   (a) Program Counter (b) Register B
   (c) Accumulator (d) Flag register.

   (v) What is SIM?
   (a) Select Interrupt Mask (b) Sorting Interrupt Mask
   (c) Set Interrupt Mask (d) None of these.

   (vi) In 8085, TRAP is?
   (a) Always maskable interrupt (b) Non-maskable interrupt
   (c) Lowest priority interrupt (d) None of these.

   (vii) The bits of the PSW Register which are responsible for selection of register banks of 8051 are
   (a) PSW.3 and PSW.4 (b) PSW.3 and PSW.2
   (c) PSW.3 and PSW.1 (d) PSW.3 and PSW.5.

(viii) 8259 is
(a) programmable DMA controller
(b) programmable interval timer
(c) programmable interrupt controller
(d) none of these.

(ix) How many bytes of bit addressable memory is present in 8051 based microcontrollers?
(a) 8 bytes (b) 32 bytes
(c) 16 bytes (d) 128 bytes.

(x) How many address lines are there in 8086 microprocessor?
(a) 16 (b) 8 (c) 20 (d) 12.

Group – B

2. (a) What are the functions of control and status signals? How many bits are stored by a 256 × 4 memory chip? Can this chip be specified as 128-byte memory?

Memory Location	Machine Code	Instruction
2000H	3EH	MVI A, 32H
2001H	32H	

(b) Two machine codes – 0011 1110 (3EH) and 0011 0010 (32H) – are stored in memory locations 2000H and 2001H, respectively as shown in the table. The first machine code is 3EH and the second code is 32H. Illustrate the representations of these two machine codes? Also draw the complete bus timings for 8085 microprocessor as these machine codes are fetched and executed? Calculate the time required to execute the opcode fetch and the memory read cycles and the entire instruction cycle if the clock frequency is 2 MHz?

(3 + 3) + (1 + 3 + 2) = 12

3. (a) Write instructions to load the 16-bit number 2050H in the register pair HL using LXI and MVI opcodes and explain the difference between the two instructions.

(b) Explain the process of demultiplexing of address bus with proper diagram.

(4 + 4) + 4 = 12

Group – C

4. (a) Given the components as listed, design an interfacing circuit for memory section of 8085 to meet the following specifications:
(i) 3 to 8 decoder

(ii) 4K × 8 EPROM – address range should begin at 0000H and additional 4K memory space should be available for future expansion.

(iii) 2K × 8 CMOS R/W memory.

(b) Define machine cycle and instruction cycle.

8 + 4 = 12

5. (a) Explain the different register organization of 8086 microprocessor with proper diagram.

(b) With the help of a proper diagram, explain the flag register for 8086 microprocessor.

(c) Explain the purpose of interrupt in a microprocessor. Explain with an example about the various classifications of interrupts in 8085 microprocessor. Also state the priority of the interrupts from highest to lowest.

3 + 3 + (2 + 3 + 1) = 12

Group – D

6. (a) What do you mean by Mode 0, Mode 1 and Mode 2 for 8255 PPI chip? Explain the control word for Mode 0 with the help of a proper example for 8255A?

(b) Explain briefly about direct memory access (DMA)? Define the two new signals available on the 8085 which is introduced due to DMA? What is 8237 DMA controller?

(2 + 2) + (3 + 2 + 3) = 12

7. (a) Draw the block diagram of 8259A. How many types of priority modes are available under software control in the 8259A?

(b) What are the tasks that are performed by 8259A?

(3 + 3) + 6 = 12

Group – E

8. (a) Explain the difference between the instruction MOV R0, #55H and MOV R0, 55H. Write the assembly language program in 8051 microcontroller to add the numbers 56H and 95H and show manually how the CY, AC and P flags are affected.

(b) Describe the program status word register of 8051 microcontroller.

(c) Explain the interrupt system of 8051 microcontroller.

(2 + 2) + 4 + 4 = 12