S'09 : 6 AN : CP 425/EL 415/425/435/EC 405 (1460)

MICROPROCESSORS AND MICROCONTROLLERS

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** *and* ALL *from* **Group C.**

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answered at one place.*

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Group A

1. (a) Name the different control signals of 8085 micropro-
cessor and explain the use of each one.   10

   (b) What is meant by segmented memory ? What are the
different segments of memory with which 8086 can
work ? List the advantages of segmented memory.   10

2. (a) Discuss about BSR (bit set reset) mode of operation
of 8255 programmable peripheral chip.   5

   (b) Name the different addressing modes supported by
8085 instruction set and explain each one with the
help of suitable examples.   10

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1

(c) Distinguish between memory mapped I/O and I/O mapped I/O.   5

3. (a) Write an assembly language program using 8085 instructions to multiply two unsigned 8 bit binary numbers using shift and add algorithm. Also, explain working of the algorithm with an example.   10

(b) Name the flag bits of 8086 and explain the use of each one of them.   3+7

4. (a) Explain the use of 'RIM' and 'SIM' instructions of 8085.   10

(b) With the help of a schematic diagram, explain how a DAC chip can be interfaced to 8085. Also, explain how different waveforms can be generated using the DAC interface circuit.   10

Group B

5. (a) Draw the memory map for the 128 byte internal RAM of 8051 microcontroller.   4

(b) Explain the alternate port functions of 8051 microcontroller.   10

(c) Explain the following instructions of 8051 microcontroller: 3 × 2

(i) DJNZ R_0, HERE

(ii) CJNZ @ R_i # data, rel

(iii) SWAP A

6. (a) Explain the use of following bits of the TMOD register: (i) Gate, and (ii) C / T.   2 × 3

(b) List and explain the arithmetic group instructions of 8051 microcontroller.   10

(c) Write a delay program using 8051 instructions.   4

7. (a) Discuss about the interrupt structure of 8051 microcontroller in detail.   10

(b) Write an assembly language program using 8051 instructions to add an array of unsigned binary numbers available in RAM location 50 to 5F and store the result at locations 70 and 71.   10

8. (a) Explain the Mode-1 and Mode-2 operation of the Timer-0.   5

(b) Explain, with the help of a diagram, how external RAM (data memory) 2 KB chip can be interfaced to 8051 microcontroller.   10

(c) Discuss about the row scanning method of identifying the key in the matrix keyboard.   5

Group C

9. Answer the following :   10 × 2

(i) Distinguish between OV (overflow) flag and CF (carry) flag.

(ii) List the advantages of interrupt I/O compared to polled I/O.

(iii) Find out the locations reserved in the interrupt vector table of a 8086 based system for INT-10.

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2

(*iv*) How many 8259 programmable interrupt controller ICs are to be cascaded to provide interrupt to 22 different devices ?

(*v*) Name a single 8085 instruction which can give a left shift to the 16 bit data available in H-L register pair.

(*vi*) Is it possible to realise the stack in the external RAM in 8051 microcontroller based system ? Justify your answer.

(*vii*) If the external frequency of a 8051 is 11·0592 MHz, find out its machine cycle frequency.

(*viii*) Name the flag bits of PSW of 8051 microcontroller which is used to select the register bank. Also, list the instructions required to select the bank-2.

(*ix*) Find the value (in hex) loaded into THO by the following instruction :

$$\text{MOV THO, } \# -60_D .$$

(*x*) What is the use of ALE signal in 8051 based system ?

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3

W'09:6 AN:CP 425/EL 415/425/435/EC 405(1460)

MICROPROCESSORS AND MICROCONTROLLERS

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Group A

1. (*a*) Explain the functions of $\overline{\text{RESET IN}}$, SOD, X1 and
    X2 pins of 8085.   6

    (*b*) Draw the timing diagram of MVI B data. Indicate
    machine cycle, states, and modes of addressing.   8

    (*c*) Write a program to generate a symmetrical square
    wave using SOD line.   6

2. (*a*) Explain the LDAX, XCHG, and DAD instructions of
    the 8085 with examples.   6

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4

(b) Draw and explain each block and sub-blocks of an interrupt controller IC.   10

(c) Draw the format of the control word resister of the 8255.   4

3. (a) Suggest an arrangement to interface $2K \times 4$ size of a RAM to 8085 with the starting address at 4004H.   14

(b) Draw a block diagram of the IC 8254 and indicate its difference with respect to that of the 8253.   6

4. (a) Write an assembly language program to generate a square wave using DAC and the programmable peripheral interface. Why is divide by 3 counter used while interfacing the ADC 0808 with 8085 ? Also, explain the details of the 0808.   15

(b) Differentiate between maskable and non-maskable interrupts with examples.   5

Group B

5. (a) Explain different addressing modes of the 8051 with examples.   10

(b) Differentiate among the following instruction :   6

MOV A, @ R1

MOVC A, @ A + DPTR

MOVX A, @ R1

(c) What would be the change in the flags after   4

$$\begin{array}{r} FF \\ + F0 \\ \hline \\ \hline \end{array}$$

6. (a) Discuss the operation of the stepper motor. What are its advantages with respect to d.c motors.   10

(b) What do the following instructions do ? 5×2

(i) SWAP A, (ii) RRC A, (iii) XRL A, (iv) CPL A, and (v) RL A

7. (a) Describe the operation of timers/counters of the 8051. How does the 8051 decide to act like timer or counter ?   10

(b) Explain the functions of following instructions : 5×2

(i) NOP, (ii) RETI, (iii) SUBB A, R1, (iv) INC A, and (v) DIV AB.

8. (a) Explain SBUF and TMOD registers of 8051. How do you differentiate between polling and interrupts ?   10

(b) Differentiate between microprocessors and micro-controllers. How DIV AB and MUL AB instructions differ from one another ? How are the values stored in A and B registers ? Can register B be replaced by any other register from bank ?   10

Group C

9. Answer the following in brief : 10×2

(i) Name vector interrupt of the 8085.

(ii) Which is the highest interrupt in the 8051 ?

(iii) What are assembler directives ?

(iv) What are names of 8257 ? Why ?

(v) What are instructions that instruct the 8051 to start timer 1 or timer 0 ?

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5

(*vi*) What is the function of the program counter ?

(*vii*) What is the addressing mode of CALL ?

(*viii*) What is an op code ?

(*ix*) Write a program to exchange the data of PSW and HL pair of the 8085.

(*x*)   Write assembly language program to set two LSBs and reset two MSBs and complement rest of the four bits of the accumulator.

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Group A

1. (a) Suppose you are required to handle three ex-
ceptions in a process control plant. Can you use
8085 without any interface chips? Explain your
approach. Explain the case when the number of
interrupts are (*i*) 7, and (*ii*) 14.   4+3+3

   (b) Name a serial port in your PC which can also be
realized using a particular chip and 8085 micro-
processor. Explain the serial communication
modes such that we can transfer serial data from
the external bus in the following two cases:
(*i*) Using clock (synchronous), and (*ii*) without
using a clock (asynchronous).   3+3+4

2. Explain the following 8085-based assembly language
instructions:
(*i*) CNZ 5000 H, (*ii*) PCHL, (*iii*) MOV B,M, (*iv*) RET,
(*v*) XRA A, (*vi*) STC, (*vii*) LDA F800 H, (*viii*) XCHG,
(*ix*) DAA, (*x*) DAD B.   10×2

3. A signal, $x(k)$, needs to be operated as $y(k) = x(k) + x(k-1)$, where $x(k)$ is the present values of signal and $x(k-1)$ is the past values of the signal. The signal $x(k)$ is obtained by sampling a continuous signal $x(t)$. The signal $y(t)$ will be generated by a DA converter.

   (a) Bring out a plan to realize the above operation using 8085, DAC and ADC.   8

   (b) Draw the block diagram of the interface circuit.   7

   (c) Write a program to achieve this continuously.   5

4. (a) Write an assembly language program using 8085 instructions to cummulatively add eight 8 bit binary unsigned numbers, stored in eight consecutive memory locations. Also, explain the instructions.   10

   (b) What are different segments of memory with which 8086 can work? List the advantages of segmented memory? How is physical address determined from an offset address?   5+5

Group B

5. Draw and explain the formats of TMOD, TCON, SCON, IE and IP registers of 8051 microcontroller.   5×4

6. (a) Draw the memory map for the 128 byte internal RAM of 8051 microcontroller.   10

   (b) Explain the functions of ports Pϕ, P1, P2 of 8051 microcontroller. How can Pϕ be used as both output and input ports?   10

7. Explain the following instructions of 8051 microcontroller: 10×2

   (i) DJNZ R2, THERE

   (ii) CJNE A, DIRECT, REL

(iii) PUSH ϕ

(iv) MOVX A, @ DPTR

(v) MOVC A, @ A + DPTR

(vi) LJMP 4100H

(vii) MOV @ Rϕ, # data

(viii) ORL A, @ R1

(ix) XCH A, @ Rϕ

(x) SETB C

8. (a) List and explain the logical group of instructions of 8051 microcontroller with examples.   5

   (b) Write a delay program using three registers of 8051 microcontroller.   5

   (c) Explain, with necessary diagrams, how a 4-winding stepper motor can be interfaced and rotated in steps. Assume normal 4-step sequence data as 09 H, OC H, 06 H and 03 H, respectively.   10

Group C

9. Answer the following: 10 × 2

   (i) In which mode you can connect more I/O devices: (a) Memory mapped, (b) Simple I/O.

   (ii) In 8085, how many machine cycles will a CALL instruction take?

   (iii) What is the result of the instruction XRA A?

   (iv) How many programmable timers are there in 8051?

   (v) How can you initialize accumulator and carry as zero in 8085 microprocessor by two instructions?

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8

(*vi*)   What is the use of ALE signal in 8085 based system ?

(*vii*)   What is the purpose of TFϕ bit in 8051 microcontroller ?

(*viii*) What is the meaning of SETB TR1 ?

(*ix*)   What is the resolution of an 8 bit A/D converter with 0–5 V input range ?

(*x*)   What do you mean by the instruction PUSH PSW ?

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Group A

1. (*a*) Describe the control and status signals of 8085.   8

   (*b*) With a neat block diagram, explain the features of
   a 8085 programming model.   8

   (*c*) The contents of accumulator are 6AH and register
   C is A7H. Write a 8085 program to add the con-
   tents of two registers and comment on the result.   4

2. (*a*) Explain the interfacing of 8085 I/O using decoders,
   with a neat sketch.   8

   (*b*) Explain how $L \times I$ instruction is used for loading
   16 bit numbers in registers.   4

(c) Write the values of carry flag for the following instructions : (*i*) RLC, (*ii*) RAL, (*iii*) RRL and (*iv*) RAR.   4 × 2

3. (*a*) List and explain the functions of 8085 vectored interrupts.   8

(*b*) Explain data transfer in 8085 using DMA in detail.   10

(*c*) List the signals used by 8155 in handshake mode of data transfer.   2

4. (*a*) Explain the interfacing of keyboard with 8085 using 8255 PPI.   8

(*b*) Differentiate between assembler, editor and file.   4

(*c*) Illustrate and explain the transmitter and receiver section of 8251A.   8

Group B

5. (*a*) Detail the contents of a PSW program status word register of 8051.   8

(*b*) Explain the function of TCON and TMOD special function registers of 8051.   8

(*c*) List the interrupts of 8051 and their priority.   4

6. (*a*) Write a program to double the number in register *R*1 and store the result in *R*2 and *R*3. The microcontroller used is 8051.   10

(*b*) Explain the following instructions of 8051 micro-controllers : (*i*) INCA, (*ii*) INC add, (*iii*) ADD @ RP, (*iv*) ADD CA, # n, (*v*) MOL AB.   5 × 2

7. (*a*) With examples, explain different addressing modes of 8085.   10

(*b*) Illustrate the logical OR operation in 8051 using a program.   10

8. (*a*) Explain the serial communication in mode 1 : UART mode of 8051.   10

(*b*) Explain how data is stored and retrieved in 8051 using cell and stack instructions.   10

Group C

9. Answer the following :   10 × 2

(*i*) Convert 0011 1100 into hexadecimal.

(*ii*) Identify the bits in flag register of 8085.

(*iii*) If a register *B* has 11H and accumulator has 97H, substract the contents of *B* from the contents of accumulator.

(*iv*) Explain how a microprocessor differentiates between positive and negative numbers.

(*v*) Explain what the following program do :

Memory Address	Machine Code
2040	CD CALL 2020H
2041	70
2042	20
2043	NEXT INSTRUCTION

(*vi*)   Write the control word of 8255.

(*vii*)   Define the function of a program counter and
        data pointer of 8051.

(*viii*) List the mode definitions of serial communication
        in a 8051 microcontroller.

(*ix*)   What is the result of the following operation ?
                ANL   A, PO

(*x*)   Differentiate the important features of micro-
        processors and microcontrollers.

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S'11:6 AN:CP 425/EL 415/425/
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MICROPROCESSORS AND MICROCONTROLLERS

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Group A

1. (*a*) Explain the following with suitable examples :   3 × 2

   (*i*) Initialization of the stack memory

   (*ii*) Saving the contents of register pair BC into
   stack memory

   (*iii*) Restoring the contents of BC register pair

   (*b*) Draw the functional block diagram of 8085 micro-
   processor and discuss its operation.   8

   (*c*) A set of three readings is stored in memory starting

(*Turn Over*)

from 1050H. Write a program to sort the readings in ascending order :   6

Data (H) : 87, 56, 42

2. (*a*) Discuss, with suitable examples, various priority modes of programmable interrupt controller 8259 A.   10

(*b*) What do you understand by vectored interrupts of 8085 microprocessor ? State the priorities and ex-plain.   8

(*c*) Distinguish between volatile and non-volatile memory.   2

3. (*a*) Explain the following addressing modes with suitable examples :   4 × 2

(*i*) Direct addressing mode
(*ii*) Register indirect addressing mode
(*iii*) Immediate addressing mode
(*iv*) Indirect addressing mode

(*b*) Explain the operation of following instructions with suitable examples :   4

(*i*) SOD, (*ii*) S_1 and S_0, (*iii*) READY, (*iv*) SID

(*c*) Discuss the following modes of DMA transfer with a suitable example :   4 × 2

(*i*) Signal transfer mode
(*ii*) Block transfer mode
(*iii*) Demand transfer mode
(*iv*) Memory-to-memory transfer mode

4. (*a*) Interface IC 8255 to microprocessor 8085 with port A address 98H and write a program in BSR mode to generate 100 pulses at the rate of 200 Hz and duty cycle 40%.   10

(*b*) Distinguish between memory mapped I/O and I/O mapped I/O.   4

(*c*) What will be the output of the following program ?   6

(*i*) MVI A, 50 H
(*ii*) ORA A
(*iii*) PUSH PSW
(*iv*) HLT

Group B

5. (*a*) Draw and discuss the internal architecture of 8051 microcontroller.   12

(*b*) Discuss the formats of PSW register of 8051 microcontroller.   8

6. (*a*) Five bytes are stored at external data RAM from address 1000H. Store these data in in-ternal RAM from starting address 30H.   8

(*b*) Explain the following pins of 8051 micro-controller with an example :   8

(*i*) TXD, (*ii*) RXD, (*iii*) $\overline{PSEN}$, (*iv*) $\overline{EA}$

(*c*) Describe the data storage scheme in a stack structure in 8051 microcontroller.   4

7. (*a*) Explain the TMOD and TCON registers of 8051 microcontroller.   8

(*b*) Write a program to generate a square wave of frequency 2 kHz through port P1.0 by timer 0 of 8051 microcontroller.   8

(*c*) Explain the difference between forward jump and backward jump.   4

8. (*a*) Draw and explain the internal RAM structure of 8051 microcontroller.   6

(*b*) Explain the following instructions :   8

    (*i*) MOV A, # 56H
    (*ii*) MOVC A, @A+DPTR
    (*iii*) DEC @R1
    (*iv*) DJNZ R0 BACK

(*c*) Explain the interrupt vector table of 8051 microcontroller.   6

Group C

9. (A) Choose most appropriate answer and suggest the *correct* answer if options are not given for the following questions :   8 × 1

    (*i*) When a subroutine is called, the address of the instruction following the CALL instruction is stored on the ———.
    (*a*) stack pointer. (*b*) accumulator. (*c*) program counter. (*d*) stack.

    (*ii*) Time required to complete the execution of an instruction is defined as ———.
    (*a*) machine cycle (*b*) instruction cycle (*c*) T state.

    (*iii*) What is the clock frequency of 8085 microprocessor ?

    (*iv*) ——— interrupt is the non-maskable and having the highest priority.

    (*v*) ——— signal is used to separate the multiplexed address and data lines.

    (*vi*) LDA is ——— byte instruction.

(*vii*) A stack pointer is ——— bit register in microprocessor 8085.

(*viii*) Specify the restart memory location when the microprocessor is interrupted.

(B) Answer the following in brief :   6 × 2

    (*i*) Assume accumulator contents are AA(H) and CY = 0. Illustrate the accumulator contents after the execution of RLC instruction twice.

    (*ii*) Distinguish between SIM and RIM instruction.

    (*iii*) Load F2(H) directly in memory location 8000H using indirect addressing.

    (*iv*) List four categories of 8085 instructions that manipulate data.

    (*v*) Load the accumulator A with data byte 82(H) and save the data in register B.

    (*vi*) List the name of analog-to-digital converters and digital-to-analog converters.

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Group A

1. (*a*) Explain the architecture of 8085 with a neat block
        diagram.   8

    (*b*) Two switches, SW 1 and SW 2, are connected to
        port A pins of 8255 and two LEDs are connected
        to port B of 8255. Write an assembly language
        program to check the status of the switches and
        make the LEDs glow accordingly (*i*) if SW 1 alone
        is ON, make both the LEDs ON and OFF conti-
        nuously with a delay; (*ii*) if SW 1 and SW 2 are
        ON, make any one LED ON and OFF conti-
        nuously with a delay; and (*iii*) give the circuit dia-
        gram.   5 + 5 + 2

2. Explain the following 8085-based assembly language instructions : 10×2

LHLD 2500
DAA
STAX B
PUSH H
XTHL
OUT PORT
STA 4500
CALL 2000
XCHG
DAD D

3. (a) Give the interface diagram of 8085 with a DAC and write an assembly language program to generate a sawtooth and rectangular waveform.   15

(b) Write a short note on DMA transfer of data.   5

4. (a) Give the architecture of 8253 with a neat diagram and control word format.   15

(b) Write an assembly language program using 8085 to generate a square waveform using 8253.   5

Group B

5. (a) Explain the architecture of 8051 microcontroller with a neat block diagram.   10

(b) Write an assembly language program using 8051 to generate a sawtooth and square waveform using the general purpose ports of 8051.   10

6. (a) Discuss the differences of 8085, 8031 and 8051.   6

(b) Explain the instructions to access external RAM and external ROM.   4

(c) Draw and explain the timer structure of 8051 with its relevant registers.   10

7. (a) Draw the memory map for 128 byte internal RAM of 8051.   10

(b) Write an assembly language program using 8051 to access the 7 segment code of a number which is stored in ROM. Store 7 segment codes of 0-9.   10

8. (a) Explain how a d.c. motor can be controlled in its speed using 8051 microcontroller. Give the interface diagram and the program.   15

(b) Explain *any five* arithmetic instructions of 8051.   5

Group C

9. Answer the following in brief : 10×2

(i) What is the result of instruction XRA A ?

(ii) What is the size of internal ROM in 8051 ?

(iii) If a 8-bit DAC gives output from 0-5 V, what value should be given as input to generate 2.5 V ?

(iv) Differentiate between assembler and simulator.

(v) What is the purpose of ALE signal in any processor ?

(vi) What is the purpose of HOLD signal in 8085 ?

(vii) Define RST 1 instruction in 8085.

(viii) Find the LSB for an 8 bit DAC of range 0-10 V.

(ix) Which register in 8085 gives the size of the address bus in 8085 ?

(x) What is an emulator ?

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Group A

1. (*a*) Explain the following with suitable examples for
8085 microprocessor :   3 × 2
   (*i*) Addition of two words
   (*ii*) Exchanging the contents of HL and DE pairs
   (*iii*) Restoring the contents of flag register from stack

   (*b*) Discuss the functions of pins of 8085 micro-
processor.   8

   (*c*) A set of four bytes is stored in consecutive memory
locations starting from 8100H. Write 8085 based
assembly language program to find the minimum.
Data (H) are : F2, 05, 42, 35.   6

(Turn Over)

2. (a) Discuss how vector interrupts of 8085 micro-processor are triggered, enabled and masked. How are the vector locations computed ?   8 + 2

(b) Draw the functional block diagram of programmable interrupt controller 8259A and discuss its operation in conjunction with 8085 microprocessor.   10

3. (a) Explain the operations of following instructions of 8085 microprocessor : (i) PCHL, (ii) XTHL, (iii) DAA, (iv) LHLD 8000H, (v) ADC M, (vi) RST 7, (vii) RET, (viii) MVI M, 42H, (ix) STAX B, (x) XRA A.   10 × 1

(b) Discuss how DMA controller can work with 8085 microprocessor. Draw a suitable diagram to explain the whole operation. Assume transfer of data is occurring from memory to an I/O device.   5 + 3 + 2

4. (a) Draw the functional diagram of 8253 programmable counter timer. Discuss its different modes of operation. Also, discuss its control word.   10

(b) How can a rectangular wave be generated by 8085 microprocessor without using any interfacing device ? Explain with the help of a program. Use delay program written with the help of HL pair.   4

(c) Draw a diagram consisting of an ADC, 8255A PPI ports, 8085 microprocessor, and sample and hold chip LF 398. Explain the operation how an analog data is converted into a digital byte.   6

Group B

5. (a) Draw and discuss the internal architecture of 8051 controller.   10

(b) Discuss the pins of the same.   6

(c) How can bank 1 registers be worked with ?   4

6. (a) Four bytes are stored at external data RAM from address 4200H. Write 8051 based program for cumulative addition of these four data. Internal RAM locations are not to be used. Data (H) are : 2F, 4C, 35, 22.   12

(b) Explain the following SFRs of 8051 microcontroller : (i) TMOD, (ii) TCON, (iii) IE, (iv) SCON.   4 × 2

7. (a) Write a 8051 based delay program using four bank ϕ registers.   6

(b) Write a program to generate a square wave of 50 Hz through port P1.2 by timer 1 of 8051 micro-controller.   8

(c) Draw and explain the internal RAM (from OOH to 7FH) of 8051 microcontroller.   6

8. (a) Write four instructions for each data transfer group, arithmetic group, logical group and branch group.   4 × 4

(b) Explain the interrupt vector table of 8051 con-troller.   4

Group C

9. (A) Choose most appropriate answer and suggest the *correct* answer, if options are not given for the following questions :   10 × 1

    (*i*) What is the clock frequency of 8051 micro-controller?

    (*ii*) —— interrupt is the maskable and having the lowest priority.

        (*a*) RST 7.5   (*b*) TRAP

    (*iii*) —— trigger signal to activate RST 7.5 interrupt.

    (*iv*) —— number of machine cycles are required after the FETCH machine cycle for any 8085 based instruction.

        (*a*) Four   (*b*) Five   (*c*) Six   (*d*) Two

    (*v*) —— signal is used to demultiplex the multi-plexed address and data bus in case of 8051.

    (*vi*) —— instruction pops out the return address in the main program.

    (*vii*) Fill up the blank in the instruction.
        DJNZ —— , LABEL.

    (*viii*) Fill up the blank in the instruction.
        CJNE A , —— , LABEL.

    (*ix*) The port Pϕ is a —— —— register and —— addressiable.

    (*x*) In external RAM interfacing, Pϕ acts as a —— multiplexed bus, whereas P2 acts as —— bus.

(B) Answer the following in brief :   5 × 2

    (*i*) Assume accumulator contents are 6B (H) and CY = 1. Illustrate the accumulator contents after the execution of RAR instruction twice.

    (*ii*) Distinguish between direct register addressing mode and indirect register addressing mode by suitable examples for 8051 microcontroller.

    (*iii*) Give two bit manipulating instructions of 8051 microcontroller.

    (*iv*) Write a simple program for generating a saw-tooth waveform with the help of 8051 con-troller and DAC interfaced to Pϕ port of 8051.

    (*v*) What is the control word of 8255A PPI for the following configuration :
        Port A as input port, Port B as output port, Port C upper as input port and Port C lower as output port, Mode ϕ configuration.

W'12: 6 AN: CP 425/EL415/425/435/EC405 (1460)

MICROPROCESSORS AND MICROCONTROLLERS

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,** ANY TWO *from* **Group B** and ALL *from* **Group C.**

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answer may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks

Group A

1. (*a*) Name the control signal pins of 8085 microprocessor and explain the use of each signal pin.   10

   (*b*) Explain how a RAM chip (1k × 8) can be interfaced to 8085 microprocessor with the help of a diagram. 10

2. (*a*) Name the four segments of memory with which 8086 microprocessor work at a time. Also, explain how 8086 microprocessor access a particular location within the selected segment.   10

   (*b*) Discuss about the interrupt structure of 8085 microprocessor.   10

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3. (*a*) Draw the internal architecture of 8255 programmable peripheral interface chip in a block diagram form and explain.   10

(*b*) Explain how the microprocessor identify the activated key in a matrix hex keyboard and generates the corresponding hex code of the activated key using the row scanning method.   10

4. (*a*) Name and explain the different addressing modes supported by 8085 instruction with an example.   10

(*b*) Write an assembly level program using 8085 instructions to add an array of unsigned binary numbers. The array length is specified in memory location 1002 h. The array starts from 1003 h. Save the results in locations 1000 h and 1001 h.   10

Group B

5. (*a*) Draw the internal architecture of 8051 microcontroller in a block diagram form and explain the function of each block.   12

(*b*) Explain the memory map of the internal 128 byte RAM of the 8051 microcontroller.   8

6. (*a*) Name the alternate use of pins of port 3 of the microcontroller 8051.   8

(*b*) List and explain different modes of operation of the timer of 8051 microcontroller.   12

7. (*a*) List the programming steps needed to receive data serially using 8051 microcontroller and explain.   10

(*b*) Write an assembly language program using 8051 microcontroller instructions to generate a square wave at port 1, pin 0 (i.e., P1.0). The frequency of the generated square wave is to be 1 kHz.   10

8. (*a*) Explain the operation of the following instructions of 8051 microcontroller : (*i*) SWAP A, (*ii*) MOV A @ R_1, (*iii*) MOV$_x$ A @ R_1, (*iv*) DJNZ R_0 TABLE, (*v*) SETB P1.3. 5×2

(*b*) Name *five* interrupt sources of 8051 microcontroller and specify their respective vector address and their priority level after reset. Also, explain how the interrupts can be enabled or disabled.   10

Group C

9. Answer the following in brief : 10×2

(*i*) State a single instruction of 8085 microprocessor which can give a left shift to the content of H-L pair register.

(*ii*) Differentiate between memory mapped I/O and I/O mapped I/O.

(*iii*) List the main functions of the BIU(Bus Interface Unit) of 8086 processor.

(*iv*) Why is it not possible to use JUMP address instruction to call a subroutine program ?

(*v*) How many programmable interrupt controller (8259) ICs are required to provide interrupt request input to 58 different devices ? State the number of master 8259 and slave 8259 required.

(*vi*) How many register banks are there in 8051 internal RAM ? How to select the desired bank ?

(*vii*) In 8051 microcontroller, the crystal oscillator frequency is 11.0592 MHz. Find the machine cycle frequency.

(*viii*) State the difference between overflow flag (ov) and carry flag (cy).

(*ix*) To interface external memory to 8051, how are the address, data and control bus signals obtained ?

(*x*) Discuss the role of PSEN pin in 8051 microcontroller.

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S'13 : 6 AN : CP 425/EL415/425/435/EC405(1460)

MICROPROCESSORS AND MICROCONTROLLERS

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** and ALL *from* **Group C.**

*All parts of a question (a, b, etc.) should be
answered at one place.*

*Answer should be brief and to-the-point and be supple-
mented with neat sketches. Unnecessary long answer may
result in loss of marks.*

*Any missing or wrong data may be assumed suitably
giving proper justification.*

Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*) Discuss the operations of HOLD and HLDA sig-
      nals and INTR and INTA signals of 8085 micro-
      processor in conjunction with proper program-
      mable peripheral devices.   10

   (*b*) Explain the comparative features of memory-
      mapped I/O and I/O mapped I/O interfacings to
      8085 microprocessor along with its proper control
      signals required.   10

2. (*a*) Draw and explain the complete functional block
      diagram of 8086 microprocessor. Also, explain the
      computation of actual physical address of 20 bits.   10

   (*b*) Discuss about the interrupt structure of 8085 micro-
      processor along with SIM and RIM instructions.   10

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3. (a) Discuss the internal functional block diagram of 8253 programmable counter timer and explain its control word also.   10

    (b) Explain, with a proper diagram and assembly language program, how analog-to-digital conversion operation can be implemented with the help of 8085 microprocessor using asynchronous mode of data transfer and 8255 programmable peripheral interface chip and an ADC chip.   10

4. (a) Draw and explain the internal architecture of 8259 programmable interrupt controller. Explain its all control words also.   10

    (b) Write an assembly language program how sinusoidal and triangular waveforms can be generated by a digital-to-analog converter using 8085 microprocessor and 8255 PPI chip and a DAC chip.   10

Group B

5. (a) Draw and explain the internal block diagram and the names of all pins of 8051 microcontroller.   10

    (b) Explain the memory map of the internal 128 byte RAM and special function registers of the 8051 microcontroller.   10

6. (a) Discuss the alternate uses of port ϕ and port 2 of the 8051 microcontroller along with proper assembly language instructions and control signals.   10

    (b) Explain different types of instruction groups with the help of at least two assembly language instructions for 8051 microcontroller.   10

7. (a) Write an assembly language program using 8051 microcontroller instructions to generate a 50 Hz square wave at port ϕ, pin 6 (i.e., pϕ.6).   10

    (b) Explain TMOD and TCON control words of 8051 microcontroller.   10

8. (a) Discuss the uses of pins of port 3 of the 8051 microcontroller.   8

    (b) Name the interrupt sources of 8051 microcontroller and specify their respective vector addresses and priority levels after reset. Also, explain how the interrupts can be enabled or disabled.   10

    (c) Discuss in brief stack and stack operations of the 8051 microcontroller.   2

Group C

9. Answer the following in brief : 10×2

    (i) State a single byte instruction of 8085 microprocessor which can reset both accumulator and carry bit.

    (ii) What is the function of ALE signal pin along with port ϕ pins of 8051 microcontroller ?

    (iii) How can you generate $\overline{MR}$, $\overline{MW}$, $\overline{IOR}$ and $\overline{IOW}$ control signals in 8085 microprocessor ?

    (iv) What are the stack operations involved in CALL and RET instructions in 8085 microprocessor ?

    (v) How can you select a particular register bank, for example, R2 of 8051 microcontroller ?

    (vi) Explain the operation of CJNE instruction of 8051 microcontroller.

    (vii) How many machine cycles and T states and how much time required for executing the instruction DJNZ R_0, TABLE for 8051 microcontroller operating at 11.0592 MHz crystal oscillator frequency.

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(*viii*)   Discuss the DAA instruction operation of 8085 microprocessor.

(*ix*)   What are four different types of data transfer supported by 8085 microprocessor ?

(*x*)   What is the highest delay parameter when 8085 microprocessor executes a software delay program using decrementing operation of a register ?

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W'13 : 6 AN : CP425/EL415/425/435/EC405 (1460)

MICROPROCESSORS AND MICROCONTROLLERS

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** and ALL *from* **Group C.**

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*Answer should be brief and to-the-point and be supplemented
with neat sketches. Unnecessary long answer may result in
loss of marks.*

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giving proper justification.*

Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*)   Explain the architecture of 8085 with a neat block diagram.   10

    (*b*)   Give the interfacing diagram to interface 8085 with 1 K RAM and 1K ROM. Give the address map.   10

2. (*a*)   Differentiate between I/O mapped I/O and memory mapped I/O in 8085.   5

    (*b*)   List different hardware and software and interrupts of 8085 and mention its purpose.   8

    (*c*)   Explain the concept of DMA with a neat diagram.   7

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3. (a) Explain the functioning of 8251 USART with a neat block diagram and the control words.   10

   (b) Write an assembly language program to interface 8255 to an LED and a switch. If the switch is on, the LED should blink, otherwise the LED should be off.   10

4. (a) Write short notes on 'assemblers' and 'emulators'.   2 + 3

   (b) Give the interface diagram of connecting an 8 bit DAC to the microprocessor (8085). Write an assembly language program to generate a square wave.   10

   (c) Explain the operation of the following instructions: 5 × 1

   LHLD 2000
   XCH   G
   DAD   H
   DAA
   XRA   A

Group B

5. (a) Draw the block diagram of 8051 and explain its functions.   3 + 7

   (b) List various registers of 8051 and mention the purpose of each register.   10

6. (a) Discuss different modes of operation of the serial interface of 8051.   10

   (b) Write an assembly language program in 8051 to measure the pulse width of any signal using in-built timer.   10

7. (a) Explain the operation of the following instructions with examples: 5 × 2

   (i) MOVC A, @A + DPTR

   (ii) XCHD A, @ R0

   (iii) MOV C, P3.1

   (iv) SWAP A

   (v) RR A

   (b) An array of 10 numbers is stored in the internal data RAM starting from location 30 H. Write an assembly language program to move the array starting from location 40 H.   10

8. (a) Discuss the interrupt sources of 8051, their vector locations and different control bits used to control all the interrupts.   10

   (b) Design a microcontrolled based system to measure the temperature in an industry and to generate an alarm when the temperature limit is exceeded. Write the algorithm for the program.   10

Group C

9. Answer the following in brief: 10 × 2

   (i) Why is a crystal preferred clock source?

   (ii) What is the type of stack used in 8085?

   (iii) Why is 8085 processor called as an 8 bit processor – justify.

   (iv) How many I/Os can be connected to 8255?

   (v) Why are program counter and stack pointer 16 bit registers?

   (vi) Give the formula to calculate baud rate for serial port in macro.

   (vii) Write a program to find 2s complement using 8051.

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(*viii*) Mention the alternative function of P3.1 and P3.5.

(*ix*) If A register contains the value OF, what will be the value after the instruction SWAP A ?

(*x*) Differentiate between 8031 and 8051 microprocessors. How do you identify the IC visually, if the IC numbers are erased ?

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