

Q1.(20 M.)Suppose that a 2G*16-bit main memory is built using 256*1-bit RAM chips and that memory is 16-bit addressable. For this memory organization evaluate:

6. The number of RAM chips?
7. The number of banks?
8. The number of address bits needed for a RAM chip?
9. The number of address bits needed for the full memory?

Q2.(30 M.) A computer memory has the following memory hierarchy:

Secondary storage devices: Hard disk:40 GB, sector size:512 B, 2000track/surface,50 sectors/track,5 double-sided platters, average seek time of 10 msec. , Floppy disk, CD, and DVD supported.

Main memory: size:8Kblocks, cache memory size:512 blocks, block size:8 words.

1. How many cylinders does the disk have?
2. What is the capacity of a track in B.
3. What is the capacity of each surface?
4. If the disk rotates at 5400r.p.m, what is the maximum rotational delay?
5. Determine the number of cache slots.
6. Determine the number of tag bits address.

Q3.(20 M.)A microprocessor is used to control a 7-segment, to display the descendant decimal numbers from 9 to 0. A 8255 IO chip is used for interfacing the 7-segment to the processor. The 7-segment pins are connected to port B started from the LSB. The following figure shows the pin diagram, and the control word(control register) format of the 8255 IO chip. Write an assembly code to receive data from a table and send it out to port C.

Hint: First, Find the address of port B and the control word.

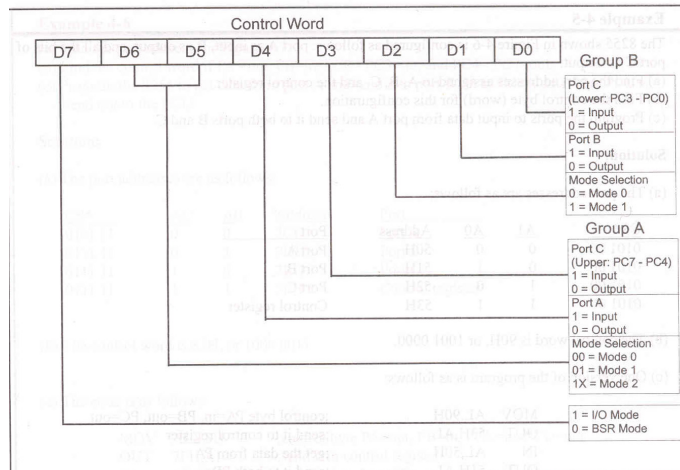


Figure 4-5. 8255 Control Word Format (I/O Mode)
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Q4.(30 M.) After the following program (8086 assembly code) is run, what will be the contents of all affected registers and status flag? All numbers are in hexadecimal. Assume CS=SS=DS=ES. The initial status of the registers are as follows:

AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
 DS=FCF8 ES= FCF8 SS= FCF8 CS= FCF8 IP=0100 NV UP EI PL NZ NA PO NC

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MOV    SP,EEEE
LEA    BX,DATA
MOV    BP,DATA
MOV    AX,BP
MOV    DI,BX
XCHG  AX,CX
ADD    CX,7
MOV    AL,44
JZ     SKIP
XOR    AL,AL
SKIP:  XOR    DI,DI
      MOV    BX,8
      MOV    DX,14
      MOV    AL,19
BACK:  ADD    DI,DI
      ROL    AL,1
      ADD    DI,DX
      DEC    BX
      JNZ   BACK
      SUB    SI,SI
DATA:  DB    03,DD
      DB    44,04
      DB    AA,09
      DB    FF
      HLT
```