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Computer Organization and Architecture
COS2621

Assignment 2
758093

Question 1

a) LOAD IMMEDIATE 20: The value 20 will be loaded into the accumulator.
LOAD DIRECT 20: The value 30 will be loaded into the accumulator.
LOAD INDIRECT 20: The value 40 will be loaded into the accumulator.

b) Immediate addressing: **mov al, 2**
Direct addressing: **mov al, [temp]**
Stack addressing: **push ax**
Indexed addressing: **mov al, [si]**
Base-addressing: **mov al, [bp]**
Register indirect addressing: **mov al, [si]**

Question 2

a) i) Error-correcting codes are used when an error is detected in the error-detecting process to fix that error.
ii) Error-detecting codes use parity bits to detect soft errors and hardware failures.

b) Spatial locality refers to the tendency of execution to involve a number of clustered memory locations.
Temporal locality refers to the tendency for a processor to access memory locations that have recently been used.

c) The Pentium 4 has three levels of cache.
The level 1 cache is a split cache, 8kb in size and four-way set associative.
The level 2 cache is a unified cache and it is 256kb in size.
The level 3 cache is eight-way set associative and 128kb in size.

Question 3

a) A DRAM cell is an analog device using a capacitor which can store any charge value within a range. This means that the values are analog, so DRAM is considered to be analog.

A SRAM cell is a digital device, binary values are stored in it using traditional logic-gate configurations. This is digital data, only 0's and 1's so SRAM is considered to be digital.

b)

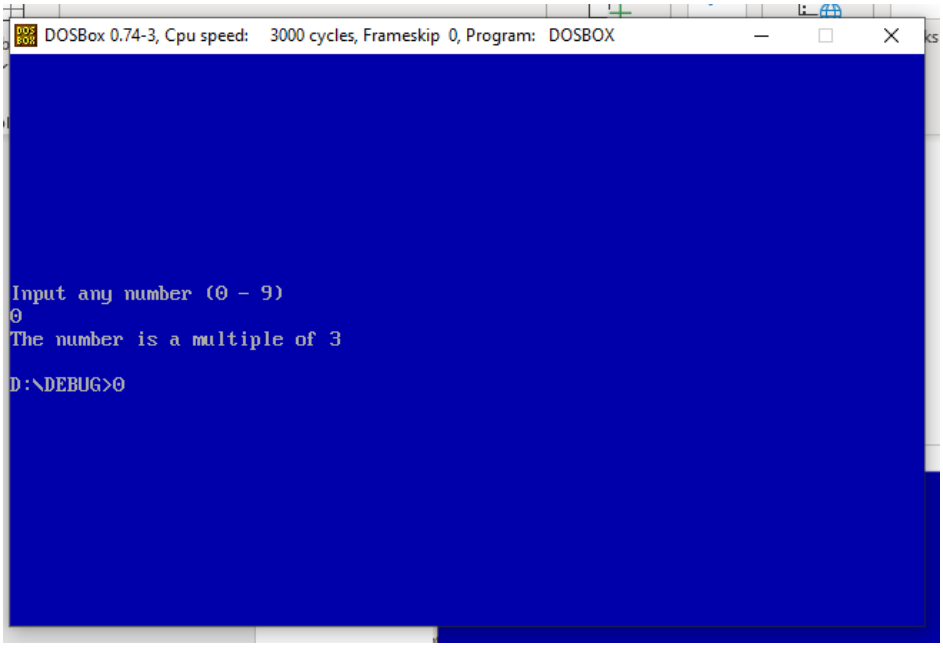
- They exhibit two states that can be used to represent a 0 or 1.
- They can be written to at least once.
- They can be read.

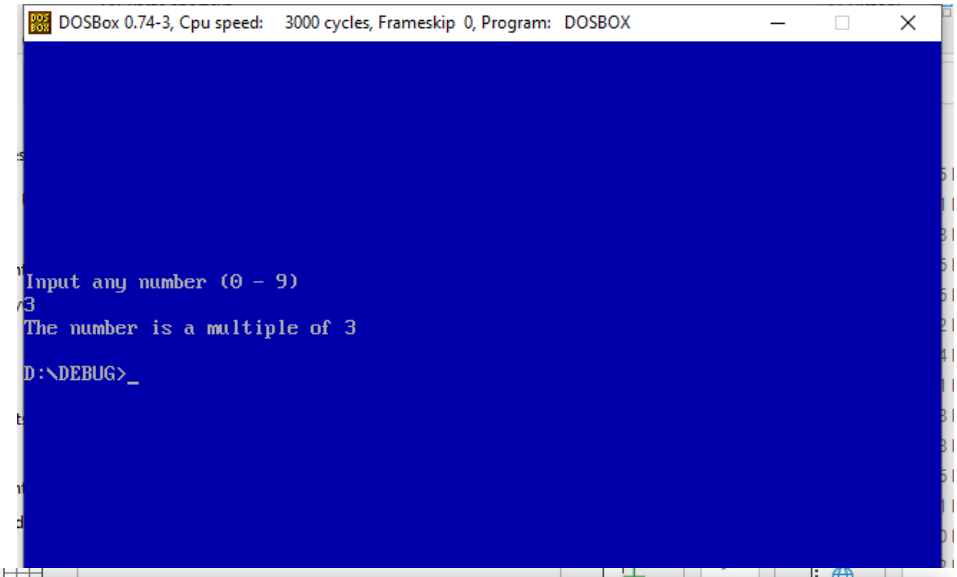
c) It's a bit added to a string of binary code and are used to detect errors with. You get even and odd parity.

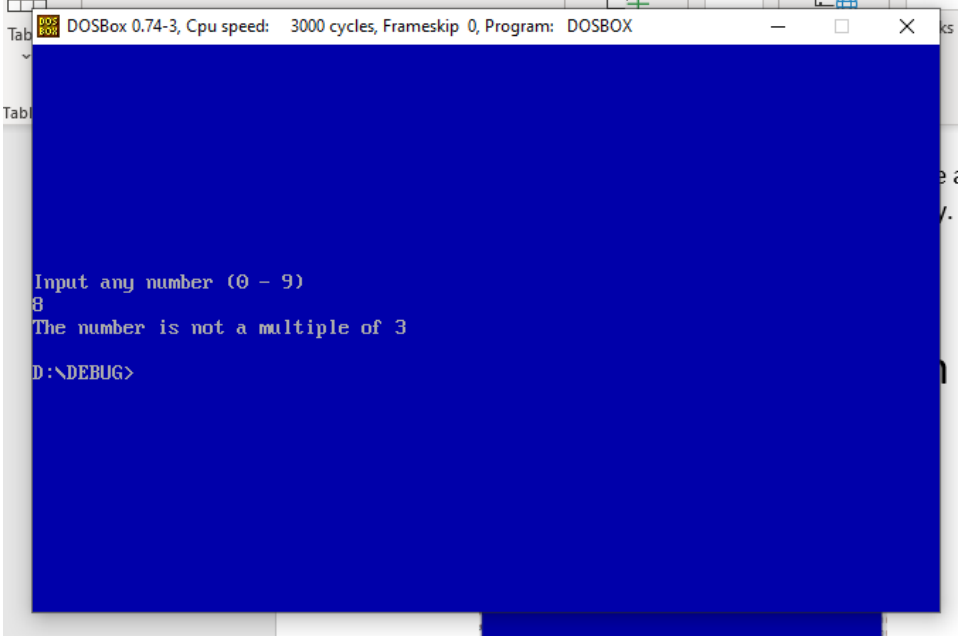
Question 4

```
bits 16
org 0x100
jmp main
mess1: db 'Input any number (0 - 9)', 0dh,0ah,'$'
mess2: db 'The number is a multiple of 3',0dh,0ah,'$'
mess3: db 'The number is not a multiple of 3',0dh,0ah,'$'
errmess: db '**',0dh,0ah,'$'
crlf: db 0dh,0ah, '$'

display:
mov ah,09
int 21h
ret

cursor:
mov ah,02
mov bh,0
mov dh,0ah
mov dl,0
int 10h
ret

prompt:
mov dx,mess1
call display
ret

input:
mov ah,01
int 21h
ret

screen:
mov ah,06
mov al,0
mov cx,0
mov dl,80
mov dh,80
mov bh,17h
int 10h
ret
```

```
newline:
mov dx,crlf
call display
ret

main:
call screen
call cursor
next:
call prompt
call input
cmp al,'0'
jl error
cmp al,'9'
jg error
sub al,30h
xor ah,ah
mov bl,3
idiv bl
cmp ah,0
je isdiv
call newline
mov dx,mess3
call display
jmp fin
isdiv:
call newline
mov dx,mess2
call display
fin:
int 20h
error:
mov dx,errmess
call display
jmp next
```


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX
Input any number (0 - 9)
0
The number is a multiple of 3
D:\DEBUG>0


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX
Input any number (0 - 9)
3
The number is a multiple of 3
D:\DEBUG>_


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX
Input any number (0 - 9)
8
The number is not a multiple of 3
D:\DEBUG>