CSE 2203 [part - manik sir]

Exam - 2016

Section - A

1. a) The advantage of using a CPU register for temporary data storage over using a memory location is about speed.

By using the CPU register, the information is kept local to the CPU. By storing a value in a memory location, a lookup has to be performed to retrieve it. A register is merely a very fast piece of storage that exists directly on the microprocessor and can be accessed synchronously without any waiting. It is conceivable to make a processor where we have no registers but only memory - it

would be probably very slow.

(b)

Segmentation: A segment is a logical unit of memory that may be up to 64kb long. Segmentation is the process in which the main memory of the computer is logically divided into different segments, and each segment has its own base address.

The advantage of segmentation in 8086:
segmentation is basically used to enhance the speed of execution of the computer system, so that the processor is able to fetch and execute the data from the memory easily and fast.
It provides a powerful memory management mechanism.

Data related or stack related operations can be performed in different segments. Code related operations can be done in separate code segments. It allows to process to easily share data. Segmentation allows to extend the address ability of the processor.

It is possible to enhance the memory size of code, data or stack segments beyond 64 KB by allotting more than one segment for each area.

—o—

(c)

High level language programs are machine independent. They are easy to learn, easy to use, and convenient for managing complex tasks.

Assembly language programs are machine specific. It is the language that the

processor directly understand.

Trade-offs are actullay the trade that exchange something of value, especially as part of a compromise.
So there are many trade-offs of choosing between assembly language and HLL.

Assembly language was created as an exact shorthand for machine level coding, so that we wouldn't have to count 1's and 0's. High level language is readable to users but assembly language is readable to processors. Assembly language is nearly compared to HLL. It has fixed program set and it is easir for a processor to read assembly code. On the other hand, High level language is much more easy to the users who code and user friendly.

—o—

(d)

SS contains 5000H,
SP contains FFE0H.

i) Physical address:

physical address is the actual position of code and data in physical memory.

ii) The mentioned segment is "stack segment"

ss. contains 5000H

so, lower range = base of the segment

~~Physical address, DS*10H + 5000H~~

Segment register has 16bit address line but memory has 20 bit address line.

so we have to convert it into 20bit by padding a zero.

∴ lower range = 50000H

∴ Upper range (top of the stack)

= Base address + offset = 50000H + FFE0H

= 5FFE0H

iii) The upper range of the stack segment is 5FFE0H

The lower range of the segment is 50000H

∴ the maximum size = 5FFE0H - 50000H

= FFE0H

That is around 64KB.

—o—

(e)

i) 32 bit microprocessor is feeding with 3 GHz clock generator.

∴ the time for each clock cycle is 1/(3 GHz) = 0.3 ns.

To complete an instruction, 20 cycles are needed. ∴ 0.3ns × 20 = 6ns

∴ The processor speed is $\frac{1}{6ns}$ ins/sec.

—o—

ii) The executing code size is 64KB

average instruction size is 32bit = 4B

∴ the code has around $\frac{64K}{4}$ = 16000 instruction

each instruction needs 6ns.

∴ It would take around (16000 × 6ns)

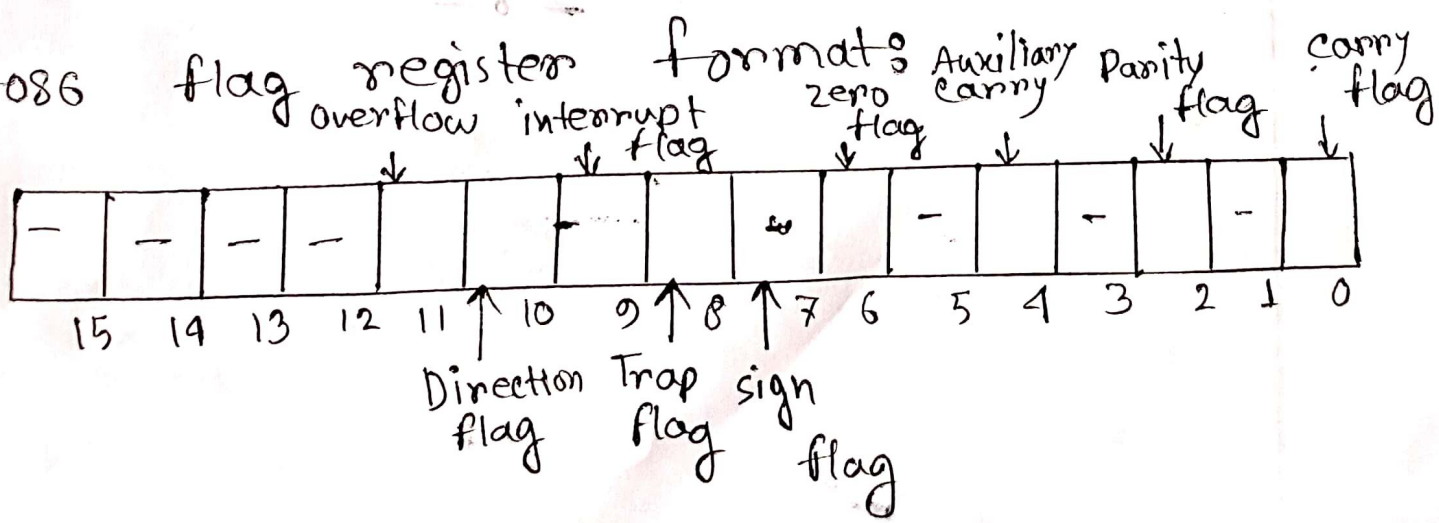
$= 96 \times 10^{-6} = 96\,\mu s$

(Ans)

2(a)

Flag register is one of the special purpose register. The flag bits are ~~or~~ changed to 0 or 1 depending upon the value of result after arithmetic or logical operations.

8086 flag register format:



In 16 bit status word, nine individual bits of the flag register are used as control flag (3 of them) and status flag (6 of them). The remaining 7 are not used.

code :

```
mov, AL, OFFH
ADD AL, 01H.
```

result is 100h in binary, 1 0000 0000

after the execution for this code, the status flags will be

CF → 1 (carry flag is set because of usigned overflow)
PF → 1 (Parity flag is set because even number of 1's)
AF → 1 (overflow in lower nibble)
ZF → 1 (result is zero)
SF → 0 (result is unsigned)
OF → 0 (it was not a singed overflow)

— o —

(b)

Addressing modes: The different ways in which a processor can access data are called addressing modes.

i) mov AX, [BX]

This mode is a register based indirect addressing mode. In this mode, the effective address of the memory may be taken directly from one of the base register or index register by instruction.

This instruction moves a word from the address pointed by BX and BX+1 is data segment in AL and AH respectively.

ii) MOV AX, [BX+8]

This mode is register relative addressing mode. the operand address is calculated using one of the base resister and a displacement of 8 or 16 bits.

iii) MOV [BX + SI], BP

This mode is base indexed addressing mode because here operand address is calculated as base register plus an index register.

iv) MOV AX, OFFFEH

This mode is immediate addressing mode. Here the operand is specified in the instruction itself.

In the above ~~instruction~~ mode, OFFFEH is directly moved to AX register.

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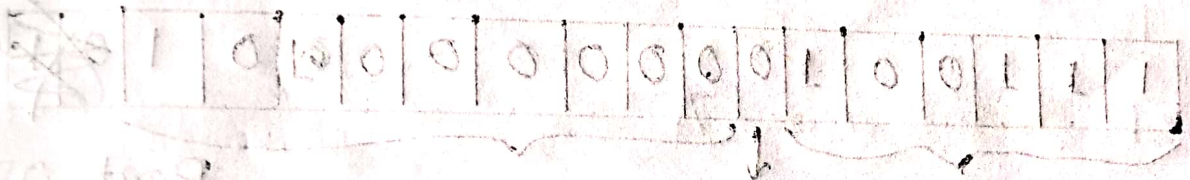
(c)

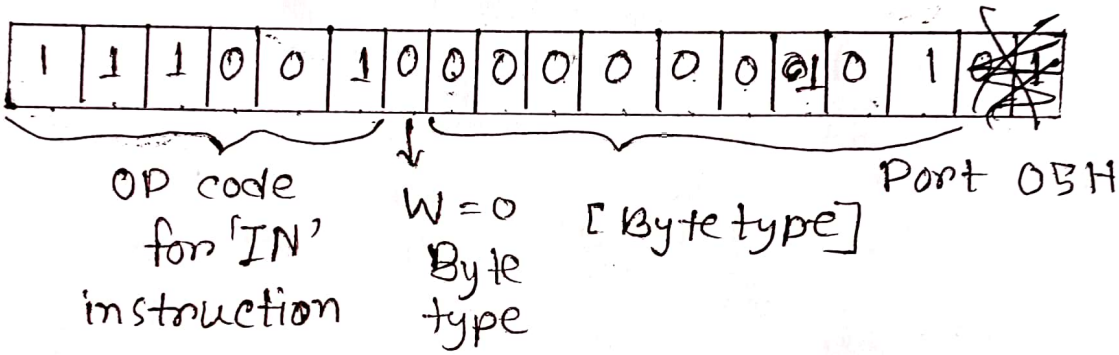


(d)

i) IN AL, 05H

This means, the IN instruction will copy a byte from port 05H to AL.

binary code:



ii) AND AL, 0FH

The 'AND' instruction means, the will do AND operation for the operand bits.

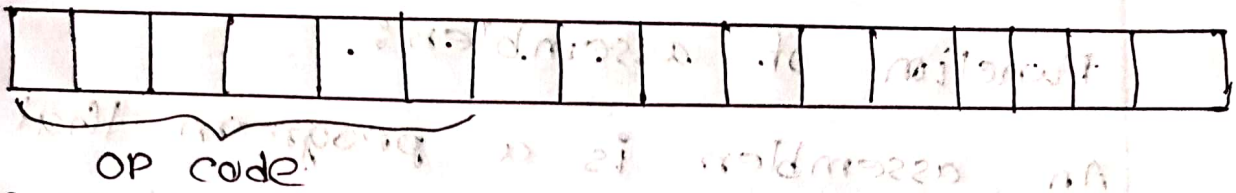
for 0FH, it'll mask out upper 4 bits of AL.

Let, AL = 0011 1101 | Here, 0FH = 0000 1111

Then,

AND AL, 0FH : Now, AL = 0000 1101

binary code:



for 'AND' instruction

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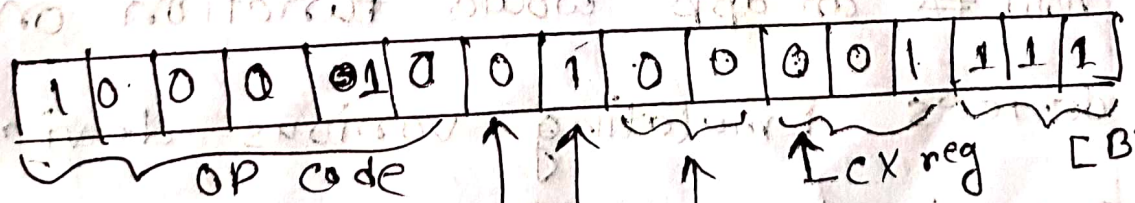
iii) ~~MOV [BX], CX~~ mov [BX], CX

This instruction will copy a ~~from~~ word from cx register to a memory location

binary code:



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3 (a)

Function of assembler:

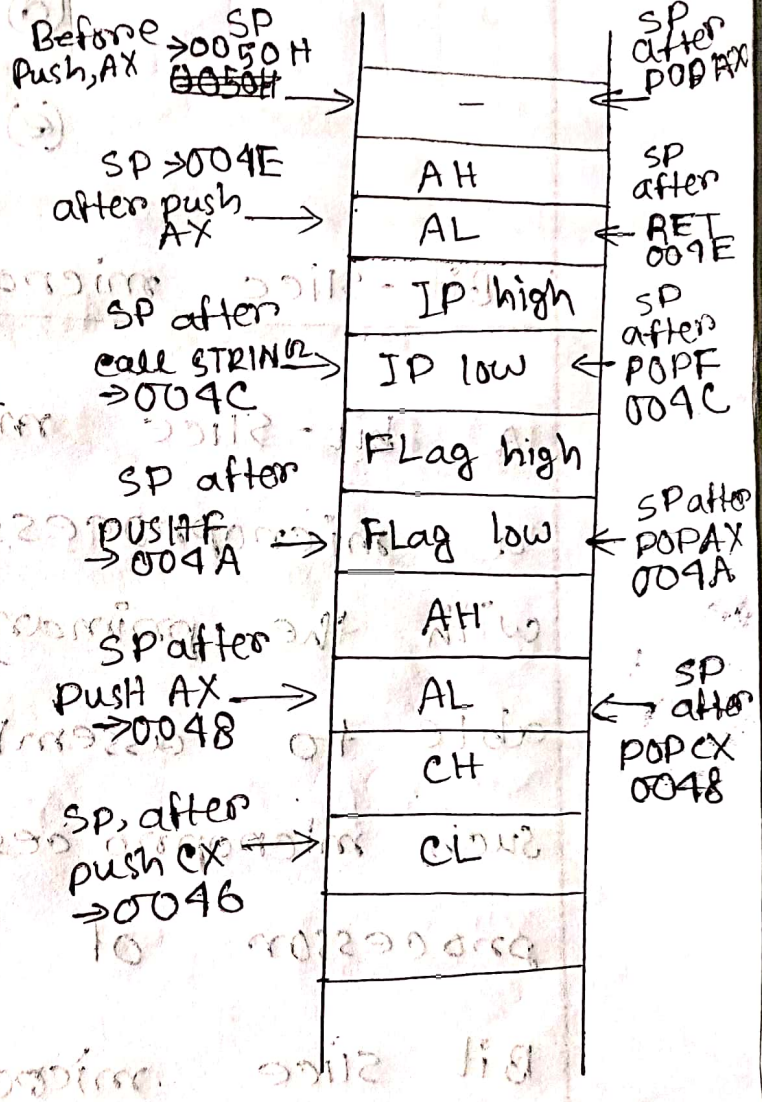
An assembler is a program that converts assembly language into machine code. It takes the basic commands and operations from assembly code and converts them into binary code that can be recognized by a specific type of processor. Assemblers are similar to compilers in that they produce executable code.

Function of emulator:

An emulator device can be used to test how an app would function on different devices. Emulating various devices informs app developers of any necessary changes to the functionality of their app, as well as improving UX and highlight other areas for improvement.

(b)

```
MOV   SP, 0050H
PUSH  AX
CALL  STRING
POP   AX
STRING PROC NEAR
~~STRING~~
PUSHF
PUSH  AX
PUSH  CX
  :
POP CX
POPAX
POPF
RET
STRING ENP
```



For push, sp decrement by 2 and for pop instruction, SP increment by 2.

(c)

(d)

(e)

Bit-slice microprocessor:

A bit-slice microprocessor (BSM) is a microprocessor designed as a module with the primary purpose of being able to assemble multiple identical such microprocessors to form a larger processor of some desired word size. Bit slice microprocessors can be cascaded to produce any conventional as well as unconventional word sizes.

$A(a, b, c, d)$