Assignment PPA

839PP_omkar

Page No.
Date

Computer Architecture Assigment - 1

1. what are the components of computer?

- computer is formed by using different hardware components:

1. Microprocessor
2. Math co-processor [ALU]
3. Storage Devices - A. Primary
   B. secondary
4. GPU [Graphics Processing Unit]
5. Input Devices - A. mous B. keyboard
6. Output Devices - A. console B. Printer
7. Motherboard
8. Bus - A. Address Bus
   B. Data Bus
   C. Control Bus

2. what are the types of storage devices?

- Storage Devices are classified into two parts:
  A. Primary storage devices
  B. Secondary Storage Devices

A Primary storage devices:

- The devices which are accessible to microprocessor are called primary storage devices
- For e.g: RAM, ROM

Page No.
Date

B. Secondary storage Devices:

- secondary storage Devices are used to store the data permanent purpose.
- Before the data gets loaded on secondary memory it's initially on primary memory.
- For e.g : HDD (HardDisk), CD, floppy
  SSD (solid state Drive)

3. what is mean x86 Toolchain?

- Toolchain is considered as set of softwares which are used to convert human understandable program into machine understandable program.

- components of x86 Toolchain:

1. Editor : program uses editor to write program.
   - After writting file gets saved on harddisk with name .c. extentension
   - its human readable.

2. compiler pre-processor - preprocess access the the file .c and genurates expanded version of .c file.
   - The file created with pre-processor is with [.i] Demo.i name and it is human readable.
   - .i stands for intermediate code.

3. compiler - The output of preprocessor is provided input as to compiler.
- compiler is a software which converts the program from one language to another.
- The program is converted into human understandable to machine dependent that is assembly language.
- The created file having extension .asm or .s

4. Assembler - The output of compiler provided to Assembler.
- Assemble is responsible to convert [prog] the prog. from machine dependent format to machine understandable format.
- The output of assembler file with extension .obj
- It is in binary but not directly executable.

5. Linker - Linker is responsible to link the .obj file generated by assembler & its dependent obj file.
- It generates output file with .exe extension.

6. Loader - Loader loads .exe file from Harddisk to RAM.
- To run / execute any application it has to be loaded on RAM.
- when its loaded on RAM it consider as process. And gets executed with OS.

4. what are the types of CPU registers? explain use of each CPU register.

There are multiple registers depends on their requirement :

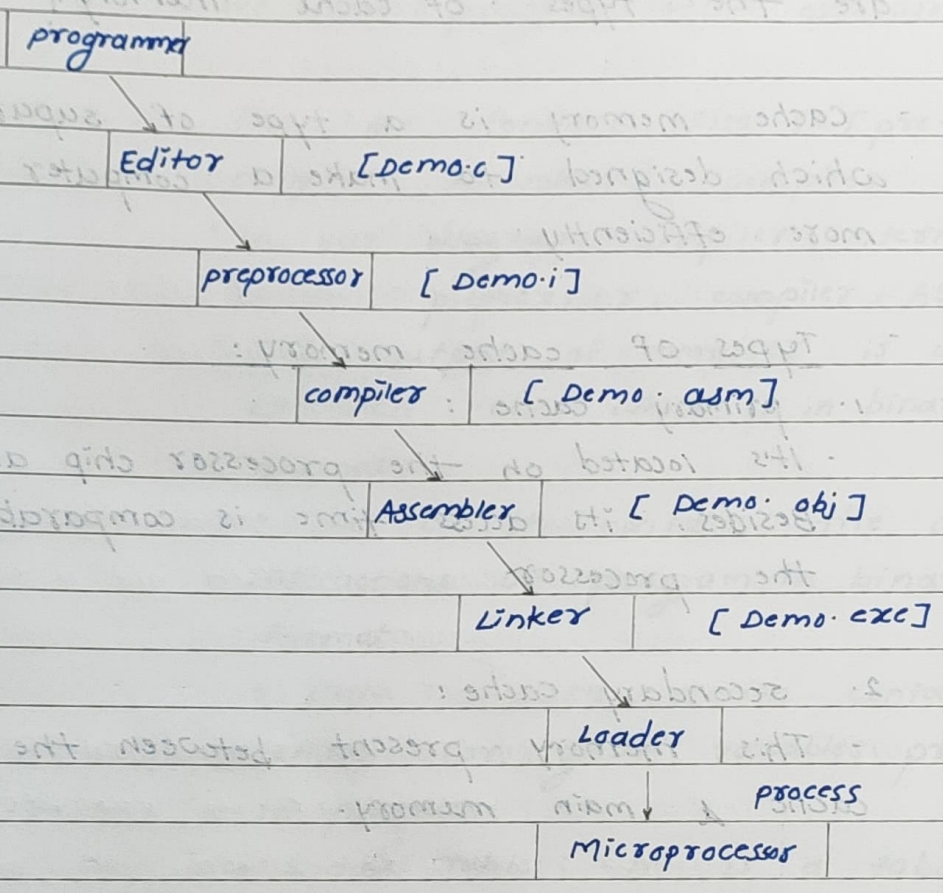
1. AH / AL - Arithmetic / Accumulator Reg.
2. BH / BL - Base registers
3. CH / CL - count register
4. DH / DL - Data register
5. SP - stack Pointer
6. BP - Base Pointer
7. SI - source Index
8. DI - Destination Index

1. AH/AL - used to perform arithmetic tasks.
2. BH/BL - used to hold base address
3. CH / CL - count register used for count as counter.
4. DH / DL - Data register used to store data
5. SP - stack pointer
6. BP -
7. SI - it indicates source.
8. DI - it indicates destination.

5. Explain working of each component from x86 Toolchain. i.e editor, preprocessor, compiler, assembler, linker, loader.

- Explained in Question number 3.

- working of each component from X86 Toolchain:



X86 Toolchain

6. What are the task of operating System.

- Task of OS :

1. file mandgement
2. process management
3. Memory management
4. CPU scheduling
5. Hardware Abstraction.

7. what is mean by cache memory & what are the types of cache memory?

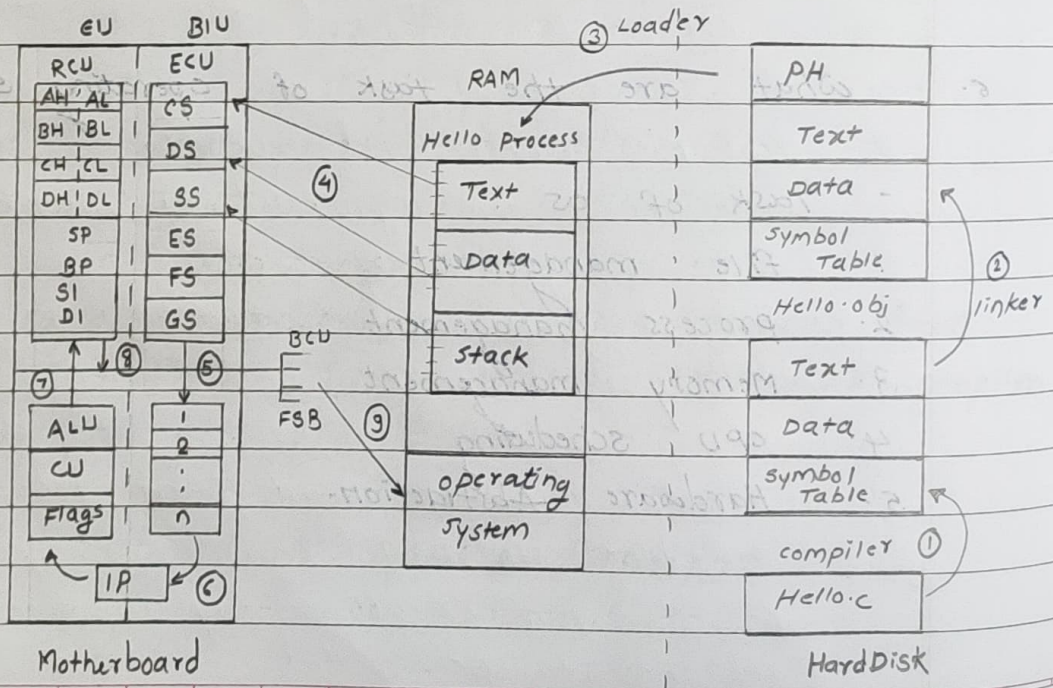
- Cache memory is a type of supur-fast RAM which designed to make a computer or device more efficiently.

- Types of cache memory:

1. primary cache :
   - It's located on the processor chip always. Besides, its access time is comparable to the processor

2. secondary cache :
   - This memory present between the primary cache & main memory.

8. Explain each step of below diagram?



Page No.
Date

- step 1 :- By using editor we write program & save the program with extension .c.
- step 2 :- The we forware file to [pre-processor, compiler, Assembler] compiler
  - In our diagram compiler internally contain preprocessor, compiler, Assembler.
  - The output of compiler is with extension .obj which is in binary format.
    - Text : It contains the compiled instructions of program in binary format.
    - Data : Data section contains memory for global variables provided in program.
    - Symbol Table : It is a table which contains the info. about the sysmbols (variables) which are used in program.
- step 3 :- we pass this obj file towards linker. the linker link the obj file with other dependent obj files.
  - The linker creates .exe file which is considered as executable file.
- step 4 :- The executable created by linker stored inside the HardDisk. For executin it must be on RAM.
  - Loader is responsible to load this file to RAM.

Page No.
Date

Step 5 - Inside the .exe file the primary Header is added (PH)
- It contain information of exe. file.

Step 6 - When its loaded on RAM it considered as a process.
- The process gets loaded into RAM is devided into three parts Text, Data, stack.

Step 7 - Stack section contains the information about function which are written inside our program.

Step 8 - Now process is loaded on RAM. RAM is not responsible to execute the process due to which we pass process to the microprocessor.

Step 9 - In microprocessor there is no sufficient memory like RAM due to which direct loading of text, data, stack not practically possible.
- Due to which each gation [of Microprocessor] is divided into segments.
- Text segment copied into CS (code segment)
- Data segment into DS (Data Segment) & stack into SS (Stack segment)
- If all above gets full then ES (extra seg) used, if ES also full the FS & GS is used respectively.

Page No.
Date

step 10 - Now data from segments gets copied into instruction queue.
- single instruction fetched at a time & forwarded for execution purpose.
- IP (Instruction pointer) responsible for this).

step 12 - Now Instruction gets [loaded] stored inside CPU registers.
- These are [CPU registers] :
1. AH / AL - Arithmetic Registers.
2. BH / BL - Base register
3. CH / CL - count registey
4. DH / DL - Data register.
5. SP - Stack pointer
6. BP - Base pointer
7. SI - Source Index
8. DI - Destination Index

Inside reg. Instructions gets executed / performed.

step 11 - Instruction forwarded to ALU if instruction is related to arithmetic function otherwise towards the CU (control Unit)
- Flags indicates internal status.

step 13 - Now output will forwarded towards the OS - operating System with the help of IDB (Internal Data Bus).
- After getting output OS will display the output on Screen.

9. what are the contents of primary Header?

- Primary Header contains the information of executable file.

10. what is mean by text, Data, Stack Section?

- when loader loads .exe file to RAM it contains three parts as:

1. Text
2. Data
3. Stack

1. Text - Section contains information about compiled instruction of program.

2. Data - section contain information of global variable which are written in program.

3. Stack - Section contains information of functions which are written in program.