CM1205 ANSWERS 2016

SECTION A

Question 1

a) The five layers are:

Physical Layer (The drive itself)
File System layer (Partition Information)
Data Layer (Where your data is stored)
Metadata Layer (Structure information)
File Name Layer (Name of file)

b) AX=Accumulator
BX = Base Register
CX= Counter register
DX=Data Register

c)

Immediate addressing is the simplest addressing mode. The instruction contains the data to be used by the instruction rather than the address of the data. E.g. MOV ECX,1024 loads the ECX register with the value 1024.
Direct Addressing contains the address of the data to be used. E.G MOV ECX, [1234] Loads the register ECX with the data held at memory location 1234.

d) CMP is the compare instruction. It performs an implied subtraction of two values, neither of which are altered.
JNZ After a CMP you can check the various flags. JNZ is Jump Not Zero.

e) Mutual Exclusion, Progress and Bounded Waiting.

f) Level 1 cache memory is cache memory closest to the CPU, usually on the same piece of silicon and has the fastest memory access after registers. The CPU will always look for data here first.

SECTION 2

Question 2

a) The decimal equivalents of 20H and 80H are 32 and 128 respectively

32 x 128 = 4096
4096 = 1000H

Upon completion of MUL CL. AX contains the result 1000H

b) The register used in conjunction with the AX register during 16-bit multiplication is the DX register. The upper half of the value 647D2710H is stored in DX the lower half in AX
DX = 647DH and AX = 2710H

c) 55AAH = 0101010110101010
1234 Decimal = 10011010010

d) Address modes:
Register/Register
Immediate Addressing
Direct Addressing
Indexed Addressing

e) The outer loop (XYZ) is executed 32 times. (CX = 20H = 32)
The inner loop (ABC) is executed 9 times.
Therefore the NOP instruction will execute 9 x32 = 288 times

Question 3

a) RAID stands for Redundant Array of Inexpensive Disks

b)

Level 0 Digital Logic

Digital circuits constructed from *logic gates*
Each gate computes a simple function based on a small number of digital inputs.
Clusters of logic gates are combined to make *registers, control circuits* and other computational devices

Level 1 Control

This level is where a control unit interprets the machine instructions passed to it, one at a time, from the level above, causing the required actions to take place.
Hardwired control units and microprogrammed control units
Hardwired: control signals emanate from blocks of digital logic components Fast but difficult to modify
Microprogrammed: machine code is implemented directly by the hardware. Slower but modifiable

Level 2 Machine

It is also called Instruction Set Architecture (ISA) Level
Consists of machine language
An instruction may be carried out in hardwired control unit (direct execution), or microprogrammed control unit (in Level 1)

Level 3 System Software

Deals with operation system instructions
Extends the ISA level with extra functions for:
Memory management
Process control
Interprocess communication
Multiprogramming

Level 4 Assembly Language

This is really just a human-readable form of one of the underlying languages
Reduce the semantic gap between machine language and high-level languages.
Based on the Machine (ISA) level
Programs in assembler need to be translated into machine language before execution
One-to-one translation: one assembly language instruction to one machine instruction

Level 5 High-Level Language

It consists of high-level languages such as Java, C/C++, Fortran, Prolog etc.
These languages must be translated to a language the machine can understand.

Level 6 User

Is composed of applications

Word processors
Games
Browsers
Mails

c) DVD uses a tighter spiral (track or helix) with only 0.74 microns between tracks (1.6 microns on CD)

DVD recorders use a laser with a smaller wavelength, 635nm 0r 650nm (visible red light) vs 780nm(infrared) for CD

DVD has a smaller “burn” (pits) in the translucent dye layer (0.4 microns min vs 0.83 microns min on CD

These technologies allow for greater storage capacity on DVD

QUESTION 4

a) CLUSTER is the smallest unit that can be **allocated** to a file in a modern hard drive, it is made up of 1 or more SECTORS the actual number of sectors is system dependant.
SECTOR is the smallest unit found on a Hard Drive usually 512 bytes of information is stored.

- MASTER BOOT RECORD The Master Boot Record is at the start of the disc and is 512 bytes in size (1 sector).
Master boot record contains the Partition table.
Each Partition entry is 16 bytes long
It also contains a piece of self executing code that is loaded at boot time and is responsible for locating the active partition and loading the boot loader program within that partition.
End of MBR marker will always be 0x55AA

b) Fixed partition memory
Advantage
Simple
Disadvantage
The degree of multiprogramming is constrained.
The size of each process is bounded.Suffers **internal fragmentation**

Memory that is internal to a partition but is not being used

c) The three placement strategies are:
First-fit: allocate the first hole large enough.
Best-fit: allocate hole with the smallest leftover.
Worst-fit: allocate the largest hole.

d) Little endian refers to how INTEL processors store a value in memory, the bytes are swapped. Least significant bit goes to the lower memory location on left, most significant bit to the right. i.e value 1234 is store 3412.

e) **Non-preemptive Scheduling**: Once the system has assigned a CPU to a process, the system cannot remove that CPU from that process
Simpler
Up to the process to release the CPU
Preemptive Scheduling: The system can remove the CPU from the running process.
Need extra hardware (timer)
What if the process is in the middle of updating some data?