1-a

It is not much large so it can be think like embedded system and latency could be tolerated so it resembles real time system.It can give late response to user.It is not much problem like hard-time os.It resembles traditional general purpose os,because os should make memory management hardware abstraction,file management,I-O management,resource management,processes and threads management.We still need this kind of managements

1-b

We can think policy as what can be done.Procedure is like how it can be done.Shortly questions are how and what.This provides flexibility,modularity and modern operating systems uses.When policy change,procedure does not change.I will give one example by using round robin scheduling.It gives an quantum time to each process.We can think this procedure.

1-c

Our purpose is that we don't want cpu to work to much.I mean,cpu should handle own works and when interrupt happen,cpu leaves the process and don't make polling.In polling,cpu regularly asks is it ready,is it ready,and waste time of cpu.Instead of polling,we use interrupt-driven control.When data ready,interrupt happens.

1d-

In batch systems,main purpose is that processes should finish task and then goes to other process.That is why non preemptive scheduling is used in batch systems but time sharing very important.Fairness is important and time-sharing provides fair and decrease average wait time

2-a

Thread 1 is 25ms,thread 2 is 20ms and thread 3 is 30ms

i)number of context switching is 25/10+20/10+30/10=8 . 25/10=2,5 but it should be integer and ii)there is 8 context switching and 8x2=16ms.Also we should consider threads time which is 20+25+30=75ms.Total time is 75+16=91 ms.

iii)average turnaround time is 75/16=4.75

2-b

Preemptive scheduler mens that context switching can happen even if process does not finish its own work.if thread yields voluntorily,preemptive scheduling allows this and other threads start running but in non-preemptive,scheduling does not allow this and continues running.

2-c

Stack usage is also important topics of processes and Threads.stack uses last in first out mechanism.Some registers like program counter,stack pointer are kept in stack.It makes faster and provides efficieny.If threads share single stack,Thes use the same data and makes efficient

2-d

İnt counter=0;

function increment_counter(){

return counter ++;

}

I did not use parameter to have race condition.If ı would pass counter as parameter,I would prevent race condition

3-a

We have sixteen(16) row in page table and we can represent this with 4 bits.our physicall address is 100001 which is 6 bits.So virtual address should be 7 bits and offset is 001 which is 3 bits.

final virtual address is 1100001.Number of virtual address entries are 2^7=128,number of physical address entries are 2^6=64.Virtual page number is 100 which is fourth entry.

3-b

This situation is called oom(out of memory) operating system detects when interrupt happens.OOM killer according to the usage of ram,priority,executed time etc chooe appropriate one and terminate it.Also Swapping could be use.

3-c

(200x100)/10=>Total memory access time in terms of microsec which is 2000 microsecond.And one of them makes a page fauld and 10ms which is 20000 microsecond.Total access time=22000 microsecond

3-d

i) 1,1-2,1-2-3,2-3-4,2-3-4,3-4-1,4-1-5,1-5-2,1-5-2,1-5-2,5-2-3,2-3-4, 3-4-5.Total page fault is

10

ii)1,1-2,1-2-3,4-2-3,4-2-3,4-2-1,5-2-1,5-2-1,5-2-1,5-2-1,5-2-1,5-2-1,3-2-1,4-2-1,5-4-1.Total page fault is 9

iii)LRU algorithm gives close result to optimal algorithm.Page fault is 8.

4-a

In hard link,same i-nodes shared but in symbolic link,it use different and it is like a pointer or shortcut.When context changes,both affected ad when file deleted,hard link continues but symbolic link becomes broken.

4-b

Stable storage is different from RAID.In Raid,we use different disks but it is like a one disk.There is many disc but it is shown as one disc.In stable storage,there is flush mechanism.It is much stable than Raid(Raid 6 is also stable).It provides efficieny

4-c

Seperating file methods from file content is important.file content changes but metadata does not change easily.Snapshotting means that take a screenshot and backup the file.Advantage is that writing a file and system crashes,all information loses but if we seperate,it becomes more security.

4-d

There are 12 direct pointers,1 single indirect pointers and 2 double indirect pointers.12^1^2=15 bits.

i)File size is 2^31/2^15=2^17

ii)5x2^10/2^2=2^8x5=1280/14=320 blocks needed.

5-a

7200 means that 7200 rotates per minutes.In one minutes,average rotate is 60000/7200=8.3 ms.Average rotational latency is that 8.3/2=4.15 ms.

Total formula is seek time+Average rotational latency + transfer time

ii)256 kb is 256x10=2560MB

5-b

In some cases,polling is more appropriate than interrupts.For example,If cpu is running with one process,don't need the intterrups because there is no processes should be executed.It increase the performance and not need to be hardware.And control becomes very easy than interrupts.

5-c

General purpose operating system do not use deadlock prevention strategies in every situation for example,There should be same processes which has to keep specific resource during execution and not need to be deadlock preventation.Some processes can have much priority than others.

5-d

When a guest os executes privileged instruction,it is not allowed this in user space but hypervisor takes the request and handles the privileged instruction and return result to the guest os.so system works very well and privileged instruction.