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ENCS3390 Midterm

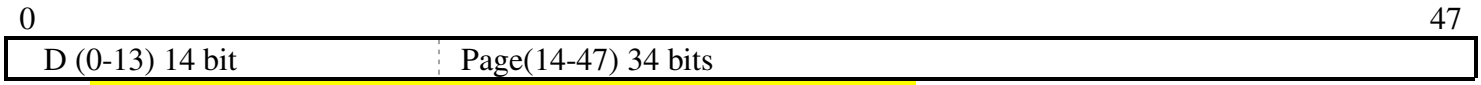
Part 2

Q	Grade
Q3	
Q4	
Q5	

Q3)(22) A computer system has 32 GB of physical memory (RAM). The system has an 16KB

page size and 48-bit logical address space. CPU generated addresses are 6 bytes each.

1. Indicate on the diagram below which of the bits of the logical address of 48 bits are used for page number (p) and for page offset (d)



Please note that the offset (should be in the least significant bits)

2. How many frames are there in the RAM?

Number of frames = Physical Memory Size / Frame size = 32GB /16KB = $2^{35}/2^{14}= 2^{21}$ Frames = around 2 M frames

3. Ignoring page table overhead and OS needs, how many pages can a process have (max) in contiguous memory allocation mode?

Max pages in physical memory is Min (# of frames in Physical memory, Max page sin the process) in this case it is limited by physical memory size

Max Pages to be in memory for a process = # of frames in memory = 2^{21} pages

4. How many bits are minimally needed for frame numbers of this computer page map tables (page tables)?

Since the memory size = 2^{21} frames we need at least 21 bits

5. Given a 5GB process, what is the size of the page table in bytes? If the page table is flat (one level) (assume minimum number of bytes for frame number)?

Page Table size = # of pages x entry size

Entry size = round 21 bits to Bytes = 3B

#pages = Process Size /Page Size = 5GB /16Kb = (5 x 2^{30})/2^{14} =320 2^{10} pages

Page Table size = 320 2^{10} x 3B = 960 KB

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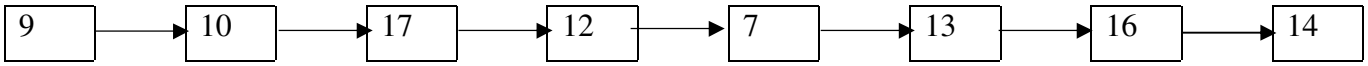
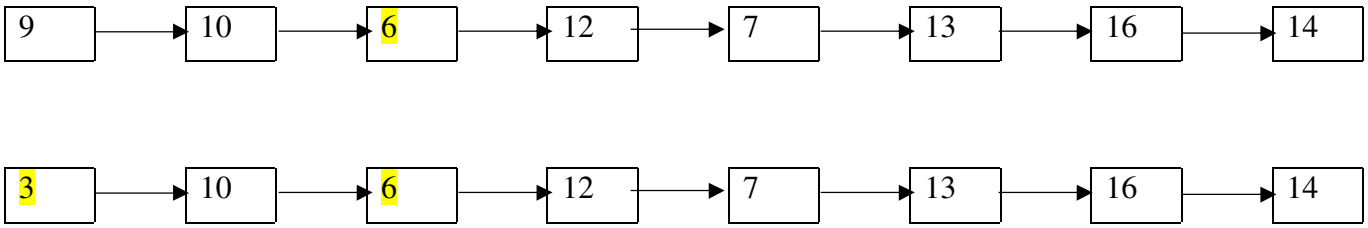
Q4) (20 points) Consider a dynamic partitioning system in which the (free) memory consists of the following list of **holes** (free partitions), sorted by increasing **memory address** (all sizes are in Megabytes):

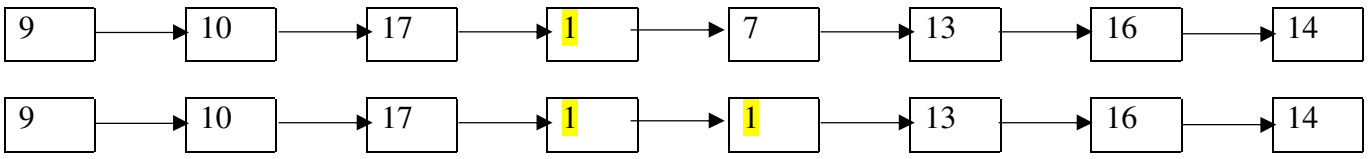


Suppose a new process A requiring 11 MB arrives, followed by a process B needing 6MB of memory. Show the list of holes **after each of** these processes are placed in memory for each of the following algorithms (start with the original list of holes for each algorithm). Assume that **the hole List Start Pointer always points to the leftmost in the hole.**

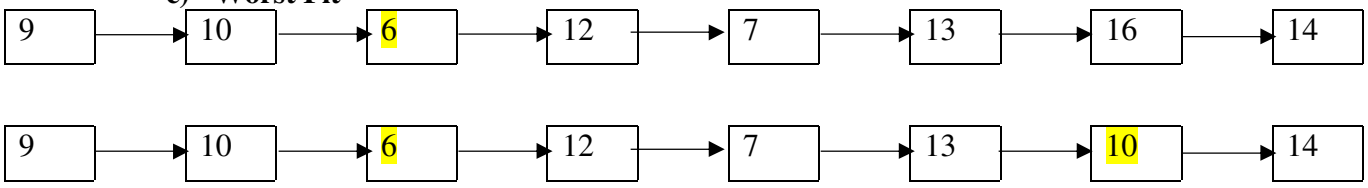
a) First Fit



b) Best Fit



c) Worst Fit



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Q5) (11 points) Using the fork(), waitpid(), and kill() system calls,
Write a program in which a parent creates 5 children. The parent then waits for the second child to complete, and kills the first and forth when the second completes. After that, the parent exits.

Hint:
`waitpid()` is a system call that suspends the execution of the calling process until a child specified by **pid** argument has changed state.

```
pid_t waitpid(pid_t pid, int *status, int options)//0 for options
```

`kill()` is a system call used to send any signal to any process group or process.

```
int kill(pid_t pid, int sig);//SIGKILL signal kills the process
```

```
pid_t pids[5];


for (int i=0;i<5;i++)
{
        pids[i]=fork();
        if (! pids[i])
        { // this is a child do something
          Return;
        }
}
waitpid(pids[1],NULL) ; // wait for second child;
kill (pids[0],SIGKILL);  // kill first child
kill (pids[3],SIGKILL);  // kill forth child
```