COSC 450 Operating System Mini-Test #3

1.

   a.

- Size of Each block = $8 \times 8 \times 2^{10}$ bits = 2^{16} bits
- One block can keep = size of block/size of a block address = 2^{16} bits / 32 bits = $2^{16} / 2^5$ = 2^{11} -1 = 2047 block information
- Total # of blocks in the disk = size of disk / block size
  = 128GB / 8KB blocks = $128 \times 2^{30} / 8 \times 2^{10}$
  = $2^7 \times 2^{30} / 2^3 \times 2^{10}$ = $2^{37} / 2^{13}$ = 2^{24} blocks
- # of blocks need to keep track of free blocks = 2^{24} blocks /2047 = 8196.002
  ∴ 8197 blocks

   b.

- Total # of blocks in the disk == 2^{24} blocks
- Need 2^{24} bits for bit map= $2^{24} / 8 = 2^{24} / 2^3 = 2^{21}$ Byte
- # of blocks need for bitmap = $2^{21} / (8 \times 2^{10}) = 2^{21} / 2^{13}) = 2^8$ blocks

   c.

- Since this system use 32bit disk block number, this system support 2^{32} blocks
- Maximum disk size = $2^{32} \times 8 \times 2^{10}$ Byte = 32×2^{40} = 32 TB

2.

- Number blocks = 8TB / 2 KB = $8 \times 2^{40} / 2 \times 2^{10} = 2^{32}$ blocks.
- System need 32 bit to save block information.
- System can save 2 KB /32bit block information in one block = $2 \times 8 \times 2^{10} / 32 = 2^9$

3. .

Sol) since 1 block is 2KB, and 16 Byte per block address, it can save $2 \times 2^{10} / 16 = 2^{11}/2^4 = 2^7$ = 128 block information

   Total = 128 +8 = 136 block information.
   Since a block size is 2KB, largest file will be 2KB × 136 =272 KB

4.

- Contiguous allocation – each file is saved in contiguous block. Simple and quick seek time. The first block address and number of block used for each file need be saved in the directory.
- Linked-list allocation – each block is used save data and the next block address. Need many seek and rotation time. The first block address for each file need be saved in the directory.
- Linked-list allocation with FAT(file allocation table) – entire file information are saved in FAT. FAT must be loaded in RAM. wasting memory space
- Index-Node – each file corresponding to a i-node. each file information (which blocks are used) are saved in i-node. Only i-nodes currently opened files need be loaded in RAM.

5.

- Seek time + rotation delay = 5 + 4 = 9 msec
- Average file size = 8 × 2^{10} Byte = 2^{13} Byte,
- Transfer rate = 8MB/sec = 8 × 2^{20} Byte/sec = 2^{23} Byte/sec
- A file with average size can transfer 9 + (2^{13} Byte /2^{23} Byte/sec)× 10^3 = 9.0977 msec
- Read + write takes 9.0977 + 9.0977 = 18.1954 msec per one file
- 8KB takes 18.1954 msec
- Half of 16GB = 8GB
- Number of files in 8GB = 8GB/average size of file = 8GB/ 8KB = 8 × 2^{30} / 8 × 2^{10} = 2^{20}
- Half of Disk space takes
  18.1954 × 2^{20} mec = 19079259.7504msec = 19079.2597504sec = 5.2 hour

6.

- Physical Dump – Start at block 0 of the disk, writes all the disk blocks onto the output tape or disk in order, and stop when it has copied the last one.

- Logical Dump – Starts at one or more specified directories and recursively dumps all files and directories found there that have changed since some given base date