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
  $\therefore$ 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 =256 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.

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

3.

Sol)

Seek time + rotation delay = 7 + 3 = 10 msec

Average file size = 4×2^{10} Byte = 2^{12} Byte,

Transfer rate = 8MB/sec = 8×2^{20} Byte/sec = 2^{23} Byte/sec

A file with average size can transfer 10 + (2^{12} Byte /2^{23} Byte/sec)$\times 10^3$ = 10.49 msec

Read + write takes 10.49 + 10.49 = 20.98 msec

A file (average size = 4KB) takes 20.98 msec (transfer time)

Half of a 32 GB = 16 GB

Number of files in 16GB = 16GB/ average size of file = $(16 \times 2^{30}) / (4 \times 2^{10}) = 4 \times 2^{20}$

16GB space take $20.98 \times 4 \times 2^{20}$ mec = 87996497.92 msec = 87996.49792 sec = 24.4 hour

4.

a) File B is written, using 5 blocks : 1111 111**1 1111** 0000

b) File A is deleted: 1**000 0001** 1111 0000

c) File C is written, using 8 blocks: 1**111 1111** 1111 **11**00

d) File B is deleted: 1111 111**0 0000** 1100

5.

Size of bit-map = $2 \times 2^{10} \times 2^{12}$ byte = 8×2^{23} bit. = 2^{26} bit
There are 2^{26} block
Total disk size = $2^{26} \times 2 \times 2^{10} = 2^{37}$ =128 GB