5/5/22

INDIA INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

6TH Semester CS Examinations

Operating Systems (CS 3201)

Full Marks: 100   Time: 2 hrs

[Answer any 8 questions. All questions carry equal marks. A student may opt to answer more than 8 question. However, if the marks obtained by the student is more than 100 the extra marks would be curtailed to 100]

1. A disk has 8 r/w heads, 262, 144 cylinders, 512 bytes/sector and 1024 sectors/track. What is the capacity of this disk? The disk has a rotational speed of 15000 rpm, an average seek time of 4 ms. Find out the time required to read 200 KB from a sector?

2. A computer system, reading a word, has a cache hit ratio of 94% and cache access time is 1.5 ns. For a cache miss there is a 98.5% chance to get it from the RAM. If the RAM and DISC access times are 16 ns and 12 ms respectively what is the average time to access a word?

3. The following is the DOS-Directory entry structure. Time (creation/last modified) is kept in a 2-byte (unsigned integer) field in seconds. The time is accurate approximately to (+/-) n seconds per day. What is the value of n? The date is divided in 3 sub fields; day (5 bits), month (4 bits) and year (7-bits). The starting year is 1980. So, the date field may be used up to the year Y without modifying the structure. What is the value of Y?.
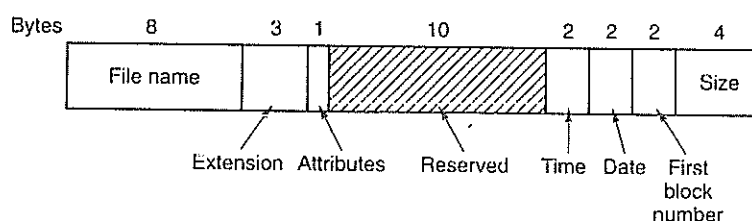
4. A file whose file descriptor is fd contains the following sequence of bytes (Values in hex): 4D, 5E, 4, 31, 30, 32, 34, 0, 0, 3, 5. The following system calls are made: lseek(fd, 3, SEEK_SET); ; read(fd, &buffer, 5) and atoi(&buffer). What value is returned from atoi()?

[Note SEEK_SET option moves file offset to *offset* (2nd parameter) bytes]

5. In a multi-programming system 4 jobs (each having 50% I/O wait time) are being executed simultaneously. Each requires 20 minutes of CPU time to complete the operation. What would the total time to complete all 4 jobs?

6. Show the i-node entries (not all are to be written) used in UNIX OS and draw a diagram showing pointers used to address disc blocks (from Direct to triple indirect). If the disc block size is 4 KB then what is the maximum size of a file that can be represented using this i-node structure?

7. Free disk space can be kept track of using a free list or a bitmap and the information is kept in one or more disk blocks. For a 4 TB disk with a block-size of 4 KB how many disc block addresses can be saved in a block using free list technique?

8. Why the disc I/O bandwidth of the old UNIX FS was very poor? What minimum change is made in FFS (Fast file system) to improve the usable bandwidth and reduce fragmentation?

9. Show the storage arrangement of RAID 4 and RAID 5 systems. With N disks what are the Sequential and Random Read/Write performance figures for RAID 4 and RAID 5 systems.

10. What are the conditions that must be true for a deadlock? Discuss in short, the approaches that can be taken to recover from the deadlock.

11. What are semaphores? What are the two operations done on semaphores?

12. What are page table (PT) and page table-entry (PTE). Other than the essential mapping information, a PTE contains a number of bits for administrative and strategic purpose. Name four such important bits and their use.

13. What are the four common memory allocation policies (like Best fit etc.)? Discuss the policies in short citing their effect on fragmentation.

14. Write in short, the essence of Journaling or write ahead logging. Also explain the meaning of Journal write, Journal commit and checkpointing.