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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- December, 2018

B.Tech 5th Semester

COURSE CODE: 10B11CI511 MAX. MARKS: 35

COURSE NAME: OPERATING SYSTEM

COURSE CREDITS: 04 MAX. TIME: 2Hrs

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Section A (5x2=10 marks)

1. What are monitors? How does a monitor support synchronization?
2. In a paged memory, the page hit ratio is 0.35. The time required to access a page in secondary memory is equal to 100 ns. The time required to access a page in primary memory is 10 ns. Find the average time required to access a page?
3. You are designing a file system from scratch. The disk driver allows you complete control over the placement of data on the disk. Assuming that you have settled for File Allocation Table (FAT) architecture, where would be the best place to store the table on disk?
4. What is the need of acyclic-graph directory structure?
5. What are the elements of a process image?

Section B (5x3=15 marks)

6. Consider a disk system with 100 cylinders. The requests to access the cylinders occur in following sequence:
   4, 34, 10, 7, 19, 66, 2, 15, 6, 20
   Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1 ms. to move from one cylinder to adjacent one and shortest seek time first policy is used?.

7. Consider a process executing on an operating system that uses demand paging. The average time for a memory access in the system is *M* units if the corresponding memory page is available in memory and *D* units if the memory access causes a page fault. It has been experimentally measured that the average time taken for a memory access in the process is *X* units. Find the expression for the page fault rate experienced by the process?

8. Suppose a program references pages in the following sequence:
   ACBDBAEFBFAGEFA
   Suppose the computer on which this program is running has 4 pages of physical memory. Find the difference in the number of page faults between the last-in-first-out page replacement policy and the most recently used replacement policy?

9. As per given following piece of code **(Prog-1)**, find how many different copies of the variable c are there? What are their values?

//(Prog -1)

```
main(int argc, char ** argv)
{
        int child = fork();
        int c = 5;
        if(child == 0)
        {
                c += 5;
        }
        else
        {
                child = fork();
                c += 10;
                if(child)
                        c += 5;
        }
}
```

//(Prog -2)

```
if(a > 0)
   P(s1);
else
   P(s2);
b++;
P(s3);
if(b < 0 && a <= 0)
   P(s1);
else if(b >= 0 && a > 0)
   P(s2);
else
   P(s4);
a++;
V(s4);
V(s3);
V(s2);
V(s1);
```

10. As per above given piece of code **(Prog-2)**, s1, s2, s3 and s4 are semaphores. All variables are automatic. Now, consider two threads running this fragment of code simultaneously, can there be a deadlock? Why, or why not?

Section C (2x5=10 marks) (ANY TWO)

11. A processor uses 36 bit physical addresses and 32 bit virtual addresses, with a page frame size of 4 Kbytes. Each page table entry is of size 4 bytes. A three level page table is used for virtual to physical address translation, where the virtual address is used as follows:
    - Bits 30-31 are used to index into the first level page table
    - Bits 21-29 are used to index into the second level page table
    - Bits 12-20 are used to index into the third level page table, and
    - Bits 0-11 are used as offset within the page

    Find the number of bits required for addressing the next level page table (or page frame) in the page table entry of the first, second and third level page tables?

12. Describe the data structures required to implement best-fit memory allocation?

13. Consider the various possible combinations of {*TLB, Page Table, Cache*} with their operations {*HIT, MISS*}. Prepare a detailed table of these combinations and find out possibility of each combination whether it is possible or not, also tabulate that under what circumstances it is possible?