BITS, Pilani-Dubai Campus, Knowledge Village,Dubai
III rd Year First Semester 2004-2005
Degree:B.E.(Hons) Branch:C.S.E

COURSE NO. : CS UC372 **COURSE TITLE : : Operating Systems**
Date : 3-10-2004

Test 1 **Total marks=30 (Closed book) Weightage=20%**

All questions carry equal marks

Q1. To which type of kernel design (monolithic or microkernel or both) do each of the following problems/advantages correspond? Why?

Resilience to errant kernel modules (1.5 marks)

- additional latencies (1.5 marks)
- Each part of kernel has access to every other part (1.5 marks)
- Portable (1.5 marks)

Q2. What is the purpose of the system calls, and how do system calls relate to the OS and to the concept of dual-mode (kernel/user mode). (6 marks)

Q3.a)With the help of an example explain why the separation of mechanism and policy a desirable property in operating system.(3 marks)

b) Classify whether the following activities belong to policy or mechanism.

i)Ability to draw a window on a different machine to that on which the requesting process is running. (1.5 marks)

ii)Cut, copy and paste are always done using the same menu items and keyboard commands.(1.5 marks)

Q4.The client-server model is popular in distributed operating sytem. Can it also be used in a single computer system?Justify.(6 marks)

Q5.Outline the effect of following hardware features on functioning of OS:

a) Hardware does not support kernel mode of operation (2 marks)

b) Hardware does not support timers(2 marks)

c) Lack of support for aynchronous I/O(2 marks)

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Time :40 mts Marks: 16 QUIZ:1 (closed book)
(Weightage =10%)

Answers should be brief and upto the point

Q1.Under what circumstance a process will move to Ready suspended state?

Q2.Under what circumstances two processes can be in running state simultaneously?

Q3.When a context switch alone will be performed by an OS ?

Q4.What is the difference between context switch and process switch ?

Q5.Why there is need for multiple event queues ?

Q6. When memory fault can take place ?

Q7.What is the main difference between executing an OS as non process kernel and execution within user processes ?

Q8. Which statement most correctly describes an operating system (OS)?
a. The OS starts up the computer, then shuts down when an application (app) is opened, and the app communicates directly with the hardware.

b. Operating systems are becoming obsolete as applications become more sophisticated.
c. The OS runs continuously and is the link between applications and system hardware.
d. Operating systems are generally free.

Q9.Why there is a need for atomic instructions in OS?

Q10.What are the two main advantages of having minimal kernel size in case of Micro kernel based operating system?

Q11.What is meant by a device driver ?

Q12. During multiprogramming, choosing the correct quantum size is important to the effective operation of an operating system. Consider a single processor timesharing system that supports a large number of interactive users. Each time a process gets the processor ,the interrupting clock is set to interrupt after the quantum expires. Assume a single quantum for all processes on the system.
What would be the effect of setting the quantum at a very large value, say ten minutes ?

Q13. In the above question What if the quantum were set to a very small value , say a few processor cycles ?

Q14. For the blocked suspended state discuss how the process got into the state, and what the process is waiting for?

Q15.How an operating system is able to execute a program whose size is greater than the available physical memory ?

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Time :3 hrs
Date:9-1-2005
(Weightage =40%)

Marks: 70 Comprehensive exam (Closed book)

Answer all the questions

Part A
*All questions carry equal marks (10*2=20)*

Q1.Specify two important advantages of microkernel approach based operating system compared to monolithic approach and some of its limitations.
Improved Portability because the micro kernel size is very small compared to Monolithic
Improved flexibility –New modules can be added in the form of servers operating in user mode
Since all the communication between OS modules have to take place via the kernel overhead is there.

Q2.What are the needs of protected instructions in operating system ?
Protected instructions are instructions that can be executed only by OS not by user programs. Security will be compromised if users are allowed to execute the following types of instructions.

- Some instructions are typically restricted to the OS

–users are not allowed direct access to I/O (disk, printer,…) (can be done through privileged instructions or memory mapping)
—Direct access to I/O devices like disks, printers, etc.
—Must control instructions that manipulate memory management state (page table pointers, TLB load, etc.)
–special mode bit settings (kernel mode)
–halt instructions –

Hence the above instructions are executed by the OS when the CPU is in kernel mode.

Q3.With proper reasoning specify any two important hardware features needed for multitasking .
Timer: Needed to generate periodic time intervals to indicate the time slot for execution of a process is over

handler. The Timer interrupts should be handled by an inteerupt handler which interrupts the CPU-In reponse to that the OS will do process switching

Outline clearly the advantages of semaphore compared to locks.
blocked waiting for threads that want to enter into critical section-No wastage of cycles

Enable interrupts within critical section

Q5.With proper reasoning outline what are the types of semaphores needed in solving synchronization issue in bounded buffer problem.

Semaphore mutex, Semaphore Empty, Semaphore full - Brief explanation

Q6.Assume that your computer contains a max physical memory of 1 mega bytes. Let there be requests for memory allocation for processes A,B,C and D as follows: 100K,240k,64K and 256K. Then process B is relesed followed by process A. Process E is newly created with memory of 75K . Then processes C,E and D and are released one by one.With relevant diagram outline how main memory is allocated to the above processes using Buddy system.

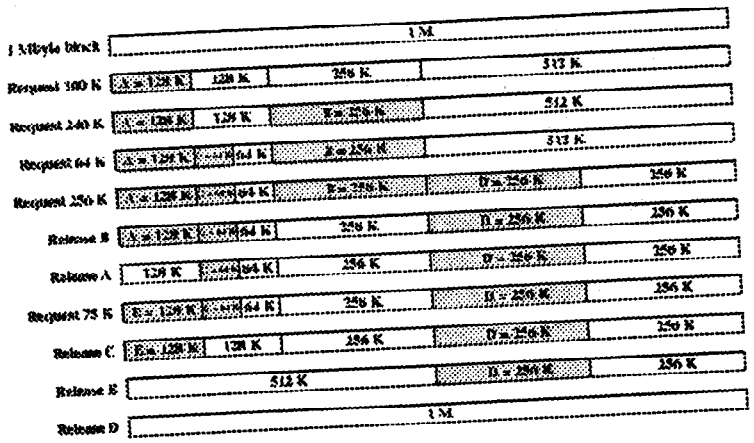

Figure 7.6 Example of Buddy System

Q7. In the case of page based memory management how many memory accesses are needed for every virtual address? Why?
•Each virtual memory reference can cause two physical memory accesses
–one to fetch the page table which contains the mapping of pages
–one to fetch the data

Q8.With diagrams specify any two conflicts between states of user level threads and process state ?

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Q2. What are the needs of protected instructions in operating system ?

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Q7. In the case of page based memory management how many memory accesses are needed for every virtual address? Why?

Q8. With diagrams specify any two conflicts between states of user level threads and process state ?

Q9.What is the reason for conflict present in Question 8 and why it is absent in the case of kernel level threads ?

Q10.In page based memory management system what is meant by page fault and how it is handled by OS ?

Part-B

*Answer all the questions . All questions carry equal marks (5 *10 =50 marks)*

Q1. Consider a readers/writer problem. Assume that readers threads 1,and 2 are created at time t=1 sec and they enter into reader method. Let a writer thread is spawned to enter into writer method at t =2 sec well before any of the readers thread starts reading the shared resource between the writer and reader. By incorporating appropriate code outline how synchronization is achieved between Readers and writer thread clearly specifying the count values of various semaphores as Readers/wirter threads make progress. Also specify how the the variable that keeps track of number of Readers threads gets updated as the readers threads make progress. (10 marks)

Q2.a)How fragmentation of main memory takes place during dynamic partitions and what is the significance of that ? (5 marks)

b)Outline any two techniques that can be used to overcome the effect of memory fragmentation with their relative merits and demerits.(5 marks)

Q3.a) What are the advantages of breaking up a Process into pages in the case of virtual memory? (3 marks)
b) How address translation in a paging system is done ?(Logical address to physical address)(3 marks)
c) Outline the basic concepts of Translation Lookaside buffer in a paging based virtual memory system.(4 marks)

Q4. Consider the following snapshot of a system and answer the following questions about the **Banker's Algorithm**: (10 marks)

	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	