11258

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2011

Fourth Semester

Computer Science and Engineering

CS 2254 - OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A - (10 x 2 = 20 marks)

1. **What are the five major categories of system calls?**

Process control, file manipulation, device manipulation, information maintenance, communications.

2. **What is the function of system programs? Write the name of the categories in which the system programs can be divided.**

- System programs provide a convenient environment for program development and execution. They can be divided into:
  - ➢ File manipulation: e.g., cp, mv, chmod, ls
  - ➢ Status information: e.g., date, ps, df
  - ➢ File modification: e.g., vi
  - ➢ Programming-language support: e.g., gcc, asm
  - ➢ Program loading and execution: e.g., ld, gdb
  - ➢ Communications: e.g., telnet
- Most users' view of the operation system is defined by system programs, not the actual system calls.
- *System programs* are invoked from the *shell* whereas *system calls* are invoked from programs.

3. **Which are the criteria used for CPU scheduling?**

- **CPU utilization** – keep the CPU as busy as possible
- **Throughput** – Number of processes that complete their execution per time unit
- **Turnaround time** – amount of time to execute a particular process
- **Waiting time** – amount of time a process has been waiting in the ready queue
- **Response time** – amount of time it takes from when a request was submitted until the first response is produced, not output (for time-sharing environment)

- Optimization Rule:
  - *Max CPU utilization; Max throughput; Min turnaround time; Min waiting time; Min response time*

4. **Write the three ways to deal the deadlock problem.**

The deadlock problem is dealt by the following one of the three ways:

- We can use a protocol to prevent or avoid deadlocks, ensuring that the system will never enter a deadlock state
- We can allow the system to enter a deadlock state, detect it, and recover,
- We can ignore the problem altogether, and pretend that deadlocks never occur in the system. This solution is used by most operating systems, including UNIX.

5. **Define TLB.**

Translation look-aside buffer. It has two parts, a key(tag) and a value.

6. **How do you limit the effects of thrashing?**

To prevent thrashing, we must provide a process as many frames as needs. The working set strategy starts by looking at how many frames is actually using.

7. **Write the attributes of a file.**

A file has certain other attributes, which vary from one operations system to another, but typically consist of these:

- **Name** – The symbolic file name is the only information kept in human-readable form.
- **Identifier** – This unique tag, usually a number, identifies the file within the file system; it is the non-human-readable name for the file.
- **Type** – This information is needed for systems that support different types.
- **Location** – This information is pointer to a device and to the location on that device.
- **Size** – current file size.
- **Protection** – controls who can do reading, writing, executing.
- **Time, date, and user identification** – This information may be kept for creation, last modification, and last use. These data can be useful for protection, security, and usage monitoring.

8. **What is the content of a typical file control block?**

file permissions

file dates (create, access, write)

file owner, group, ACL

file size

file data blocks

9. **Write the three basic functions which are provided by the hardware clocks and timers.**

- Provide current time, elapsed time, timer
- Programmable intervar timer used for timings, periodic interrupts
- ioctl (on unix) covers odd aspects of I/O such as clocks and timers.

10. **What is storage- area network?**

It is a private network among the services and storage units separates from the LAN and WAN that connects the servers to the clients.

PART B – (5 x 16 = 80 marks)

11. (a) (i) **Briefly illustrate how a server communicates to a client with a Java-based sockets program.** (12)

Old Syllabus

(ii) **Briefly demonstrate how Remote Method Invocation process works.**(4)

Old Syllabus

(b) (i) **Write about the three common types of threading implementation.** (6)

Refer section 3.6.7

11. (b) (ii) **Discuss the threading issues which are considered with multithreaded programs.** (10)

Refer section 3.6.8

12. (a) **Explain briefly any four CPU scheduling algorithms with examples.** (16)

Refer section 3.7.5

(b) (i) **Write short notes on readers- writers problem and the dining-philosophers problem.** (8)

Refer section 4.5.2 and 4.5.3

(ii) **Explain the two solutions of recovery from deadlock.** (8)

Refer section 5.8.1 & 5.8.2

13. (a) **Explain the most commonly used techniques for structuring the page table.**(16)

Refer section 6.4.1 to 6.4. 3

(b) **Explain FIFO, Optimal and LRU page replacement algorithms.** (16)

Refer section 7.4.2 to 7.4.4

14. (a) **Explain the two-level directory and three- structured directory.** (16)

Refer section 8.6.2 and 8.6.3

(b) **Give short notes on** (16)

(i) **Linux file system**

(ii) **Windows XP file system**

Refer section 9.8 and 9.9

15. (a) **Briefly describe the services which are provided by the kernel's I/O subsystem.** (16)

Refer section 10.3

(b) **Describe the different forms of disk scheduling.** (16)

Refer section 10.7.1 to 10.7.5

10. **Which disk scheduling algorithm would be best to optimize the performance of a RAM disk?**

Shortest seek time first algorithm.

Part – B (5 x 16=80 marks)

11. (a) (i) **Explain the important services of an operating system.** (8)

Refer section 2.2

(ii) **Discuss in detail the concept of virtual machines, with neat sketch.** (8)

Refer section 2.6

(b) **Write detailed notes on process control and file manipulation.** (16)

Refer section 2.9.1&2.9.2,2.10.1,2.10.2

12. (a) **Explain in detail about any two CPU scheduling algorithms with suitable examples.**

Refer section 3.7.5

(b) (i) **What is a deadlock? What are the necessary conditions for a deadlock to occur?** (6)

Refer section 5.3,5.3.1

(ii) **How can a system recover from deadlock?** (10)

Refer section 5.8.1&5.8.2

13. (a) **Explain about contiguous memory allocation with neat diagram.** (16)

Refer section 6.3

(b) **What do you mean by paging. Discuss in detail about structure of page tables with appropriate examples.**

Refer section 6.4.1 to 6.4.4

14. (a) **Write a detailed note on various file access methods with neat sketch.** (16)

Refer section 8.5

(b) **Discuss the different file allocation methods with suitable example.** (16)

Refer section 9.4.1 to 9.4.3

15. (a) **Describe the important concepts of application I/O interface.** (16)

Refer section 10.2.1 to 10.2.4

(b) **Explain any two disk scheduling algorithms with suitable example.** (16)

10.7.1 to 10.7.2

Question Paper Code : 10266

B.E./ B.TECH. DEGREE EXAMINATION, MAY/JUNE 2012

Fourth Semester

Computer Science and Engineering

CS 2254/141404/CS45/CS1253/10144CS405/080250012 - OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008)

Time : Three hours Maximum: 100 marks

Answer ALL questions

Part A - (10 x 2 = 20 marks)

1. **What are the main purposes of an operating system?**

- To provide an environment for a computer user to execute programs on computer hardware in a convenient and efficient manner.
- To allocate the separate resources of the computer as needed to solve the problem given. The allocation process should be as fair and efficient as possible.
- As a control program it serves two major functions: (1) supervision of the execution of user programs to prevent errors and improper use of the computer, and (2) management of the operation and control of I/O devices.

2. **What are the differences between user-level threads and kernel-level threads?**

(1) User-level threads are unknown by the kernel, whereas the kernel is aware of kernel threads. (2) User threads are scheduled by the thread library and the kernel schedules kernel threads. (3) Kernel threads need not be associatedwith a process whereas every user thread belongs to a process.

3. **What is the difference between preemptive and nonpreemptive scheduling?**

Preemptive scheduling allows a process to be interrupted in the midst of its execution, taking the CPU away and allocating it to another process. Nonpreemptive scheduling ensures that a process relinquishes control of the CPU only when it finishes with its current CPU burst.

4. **What are the four necessary conditions that are needed for deadlock can occur?**

- Deadlock can arise if four conditions hold simultaneously. (All four must hold)
  - **Mutual exclusion:** only one process at a time can use a resource.
  - **Hold and wait:** a process holding at least one resource is waiting to acquire additional resources held by other processes.
  - **No preemption:** a resource can be released only voluntarily by the process holding it, after that process has completed its task.
  - **Circular wait:** there exists a set $\{P_0, P_1, \ldots, P_n\}$ of waiting processes such that P_0 is waiting for a resource that is held by P_1, P_1 is waiting for a resource

that is held by P_2, ..., P_{n-1} is waiting for a resource that is held by P_n, and P_n is waiting for a resource that is held by P_0.

5. **Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the logical address and in the physical address?**

a) How many bits are in the logical address ?

b) How many bits are in the physical address ?

a) Logical Address Space is

8 Pages	1024 words

To address 8 pages we need 3 bits

To address 1024 words we need 10 bits

Total bits needed to address Logical address space is 13 bits

b) Physical Address Space

32 Frames	1024 words

To address 32 Frames we need 5 bits

To address 1024 words we need 10 bits

Total bits needed to address Physical address space is 15 bits

6. **What is the advantage of demand paging?**

A demand paging system is similar to a paging system with swapping. Processes reside on secondary memory. When we want to execute a process, we swap it into memory. Rather than swapping the entire process into memory, however **Lazy swapper** is used.

A **Lazy swapper** never swaps a page into memory unless that page will be needed. Since a process is viewed as pages, rather than as one large contiguous address space, use of swap is technically incorrect. A swapper manipulates entire processes, whereas a **pager** is concerned with the individual pages of a process.

7. **What are the two types of system directories?**

i. Single-level directory

ii. Two level directory

8. **What is garbage collection?**

Garbage collection is the process of collecting the unused memory spaces.

9. **What is seek time?**

It is the time for the disk aim to move the heads to the cylinder containing the desired sector.

10. **What characteristics determine the disk access speed?**

Rotational latency.

PART B — (5 x 16 = 80 marks)

11. (a) (i) Define the essential properties of the following types of operating systems:

(1) Batch

(2) Time sharing

(3) Real time

(4) Distributed (8)

(ii) List five services provided by an operating system. Explain how each provides convenience to the users. Explain also in which cases it would be impossible for user - level programs to provide these services. (8)

(b) (i) What two advantages do threads have over multiple processes? What major disadvantages do they have? Suggest one application that would benefit from the use of threads. (8)

(ii) Explain the various issues associated with the thread in detail. (8)

12. (a) (i) What is a Gantt chart? Explain how it is used. (4)

(ii) Consider the following set of processes, with the length of the CPU - burst time given in milliseconds:

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are arrived in the order P1, P2, P3, P4, P5, all at time 0.

(1) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.

(2) What is the turnaround time of each process for each of the scheduling algorithms in part a?

(3) What is the waiting time of each process for each of the scheduling algorithms in Part a?

(4) Which of the schedules in part a results in the minimal average waiting time (over All processes)? (12)

(b) (i) What do you mean by busy waiting? What other kinds of waiting are there? Can busy waiting be avoided altogether? Explain your answer. (8)

(ii) Consider the following snapshot of a system:

	Allocation ABCD	Max ABCD	Available ABCD
P0	0012	0012	1520
P1	1000	1750	
P2	1354	2356	
P3	0632	0652	
P4	0014	0656	

Answer the following questions based on the banker's algorithm:

(1) Define safety algorithm.

(2) What is the content of the matrix Need?

(3) Is the system in a safe state?

(4) If a request from process PI arrives for (0,4,2,0), can the request be granted immediately? (8)

3. (a) (i) Why are segmentation and paging sometimes combined into one scheme? (4)

(ii) Consider the following page reference string:

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, and seven frames? Remember all frames are Initially empty, so your first unique pages will all cost one fault each.

(1) LRU replacement

(2) FIFO replacement

(3) Optimal replacement (12)

(b) (i) Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

(1) 0,430 (2) 1, 10

(3) 2,500 (4) 3,400 (8)

(ii) Discuss briefly about memory management in LINUX. (8)

14. (a) (i) Explain the various attributes of a file. (4)

(ii) Consider a file currently consisting of 100 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies, if, for one block, the following conditions hold. In the contiguous allocation case, assume that there is no room to grow in the beginning, but there is room to grow in the end. Assume that the block information to be added is stored in memory.

(1) The block is added at the beginning.

(2) The block is added in the middle.

(3) The block is added at the end.

(4) The block is removed from the beginning.

(5) The block is removed from the middle.

(6) The block is removed from the end. (12)

(b) (i) Explain the various schemes used for defining the logical structure of a directory. (8)

(ii) Describe the approaches used in free space management. (8)

15. (a) (i) Consider the following I/O scenarios on a single-user PC.

(1) A mouse used with a graphical user interface

(2) A tape drive on a multitasking operating system (assume no device preallocation is available)

(3) A disk drive containing user files

(4) A graphics card with direct bus connection, accessible through memory-mapped I/O

For each of these I/O scenarios, would you design the operating system to use buffering, spooling, caching, or a combination? Would you use polled I/O, or interruptdriven I/O?

Give reasons for your choices. (8)

(ii) How do you choose a optimal technique among the various disk scheduling techniques? Explain. (8)

Or

(b) (i) Describe the various disk scheduling techniques. (8)

(ii) Describe the various levels of RAID. (8)

Question Papr Code : 11274

B.E./ B. TECH. DEGREE EXAMINATION, NOV / DEC 2012

Fourth Semester

S 2254/141404/CS 45/CS 1253/10144 CS 405/080250012 – OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008)

me : Three hours Maximum: 100 marks

Answer ALL questions

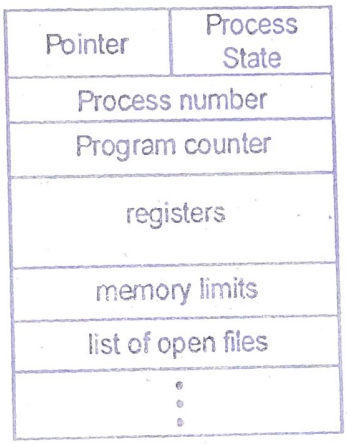
Part A - (10 x 2 = 20 marks)

What is PCB? Specify the information maintained in it.

- A PCB represents a process

PCB is a repository for any information that may vary from process to process

- Process state
- Program counter
- CPU registers
- CPU-scheduling information
- Memory-management information
- Accounting information
- I/O status information



Process Control Black (PCB)

Differentiate a thread from a process.

- Unlike processes, threads are not independent of one another.
- Unlike processes, all threads can access every address in the task .
- Unlike processes, thread are design to assist one other. Note that processes might or might not assist one another because processes may originate from different users.

3. **How does real-time scheduling differs from normal scheduling?**

- Systems waiting for completion of system call have long dispatch latency
- **Solution**: Preemptible system calls
  - ➢ Preemption points are inserted in long-duration calls that check to see whether a high priority process needs to be run. If so, a context switch takes place and , when the high-priority process terminates, the interrupted process continues with the system call.
  - ➢ Preemptible kernel with synchronized data structures

4. **What is semaphore? Mention its importance in operating systems.**

- Semaphore is a synchronization tool that does not require busy waiting.
  - *A Semaphore S is integer variable (counting semaphore) that can only be accessed via two indivisible (atomic) operations: **wait and signal**. Originally called P and V*
  - The classical definition of wait in pseudocode is

```
Wait (S) {
  While(S<=0)
     ;   // no-op
  S—;
}
```

  - The classical definitions of signal in pseudocode is

```
Signal (S) {
   S++;
}
```

5. **What is virtual memory? Mention its advantages.**

- **Virtual memory** – separation of user logical memory from physical memory.
  - ➢ Only *part* of the program needs to be in memory for execution.
  - ➢ Logical address space can therefore be much larger than physical address space.
  - ➢ Need to allow pages to be *swapped* in and out.
- Virtual memory can be implemented via:
  - ➢ Demand paging
  - ➢ Demand segmentation

6. **Differentiate between global and local page replacement algorithms.**

Global replacement : Process selects a replacement frame from the set of all frames,

even if that frame is currently allocated to some other process, one process can take a frame from another.

Local replacement : Each process selects from only its own set of allocated frames.

7. **Mention the major attributes and operations of a file.**

Attributes:

- Name
- Identifier
- Type
- Location
- Size
- Protection
- Time, date, and user identification

File Operations :

- Creating a file
- Writing a file
- Reading a file
- Repositioning within a file
- Deleting a file
- Truncating a file
- open(F_i)
- close(F_i)

8. **What is meant by free-space management?**

Since disk space is limited, we need to rescue the space from deleted files for new files, if possible. To keep track of free disk space, the system maintains a free-space list. The free-space list records all free disk blocks- those not allocated to some file or directory. To create a file, we search the free-space list for the required amount of space, and allocate that space to the new file. This space is then removed from the free-space list. When a file is deleted, its disk space is added to the free-space list.

9. **What is the need for disk scheduling?**

Whenever a process needs I/O to or from the disk, it issues a syswn call to the operating system. The request specifies several pieces of information:

Whether this operation is input or output

What the disk address for the transfer is

What the memory address for the transfer is

What the number of bytes to be transferred is

10. Give the importance of swap-space management?

Swap-space management is another low-level task of the operating system. Virtual memory uses disk space as an extension of main memory. Since disk access is much slower than memory access, using swap space significantly decreases system performance. The main goal for the design and implementation of swap space is to provide the best throughput for the virtual-memory system. In this section, we discuss how swap space is used, where swap space is located on disk, and how swap space is managed.

Part – B (5 x 16 = 80 marks)

Part – B (5 x 16 = 80 marks)

11. (a) Explain in detail the types of systems calls provided by a typical operating system. (16)

Refer section 2.3 & 2.4

(b) Explain the following :

(i) Communication in client-server systems (8)

Refer section 1.5.1

(ii) IPC in Linux. (8)

Refer section 3.5

12. (a) (i) Explain the various scheduling criteria in evaluating scheduling algorithms. (4)

Refer section 3.7.4

(ii) Explain the FCFS, preemptive and non-preemptive versions of Shortest-Job-First and Round robin (time slice =2) scheduling algorithms with Gantt charts for the four processes given. Compare their average turn around and waiting time.

Process	Arrival time	Real time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

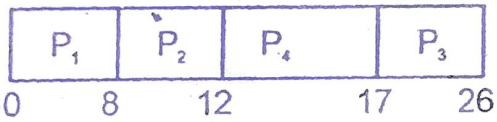
Solution :

FCFS

Process	Completed time	-	Arrival time	Turn around time
P1	8	-	0	8
P2	12	-	1	11
P3	21	-	2	19
P4	26	-	3	23
				61

$$\text{Avg TAT} = \frac{61}{4} = 15.2$$

SJF

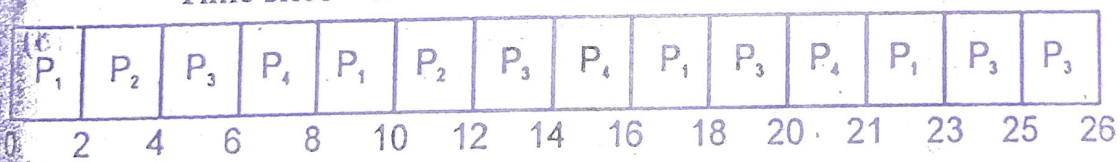


Process	Completed time	-	Arrival time	Turn around time
P1	8	-	0	8
P2	12	-	1	11
P3	26	-	2	24
P4	17	-	3	14
				57

$$\text{Avg TAT} = \frac{57}{4} = 14.2$$

Round Robin

Time slice = 2



Process	Completed time	-	Arrival time	Turn around time
P1	23	-	0	23
P2	12	-	1	11
P3	26	-	2	24
P4	21	-	3	18
				16

$$\text{Avg TAT} = \frac{76}{4} = 19$$

(b) (i) **What is critical section? Specify the requirements, for a solution to the critical section problem.** (4)

Refer section 4.2 & 4.2.1

(ii) **Explain the Banker's algorithm for deadlock avoidance with an illustration.** (12)

Refer section 5.6, 5.6.2

13. (a) (i) **Briefly explain and compare fixed and dynamic memory partitioning schemes.** (6)

Refer section 6.4.1 & 6.5

(ii) **Explain FIFO, Optimal and LRU page replacement algorithms with an example reference string. Mention the merits and demerits of each of the above algorithms.** (6+4)

Refer section 7.4.2 to 7.4.4

(b) (i) **Explain how paging supports virtual memory. With a neat diagram explain how logical address is translated into physical address.** (8)

Refer section 7.1 & 7.2 , 7.2.1

(ii) **Explain memory management in Linux operating system.** (8)

Refer section 7.7

14. (a) (i) **Explain linked file allocation method.** (6)

Refer section 9.4.2

(ii) **Explain the file system in Windows XP.** (10)

Refer section 9.9

(b) (i) **Explain the issues in designing a file system.** (8)

Refer section 9.1

(ii) **Explain the various file directory structures.** (8)

Refer section 8.6

15. (a) **Explain and compare FCFS, SSTF, C-SCAN and C-LOOK disk scheduling algorithms with an example.** (16)

Refer section 10.7. 1 to 10.7.5

(b) (i) **Explain kernal I/O subsystem in detail.** (8)

Refer section 10.3

(ii) **Explain the different levels of RAID.** (8)

Refer section 10.10

B.E./ B. TECH. DEGREE EXAMINATION, MAY / JUNE 2013

Fourth Semester

Computer Science and Engineering

CS 2254/CS 45 / CS 1253/10144 CS 405 / 080250012 – OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008/2010)

(Common to PTCS 2254 - Operating Systems for B.E. (Part-Time) Fourth semester CSE-Regulation 2009)

Time : Three hours Maximum: 100 marks

Answer ALL questions

Part A - (10 x 2 = 20 marks)

Mention the advantages in using multiprogramming systems.

Multi programming increases CPU utilization by organizing jobs. So, that the CPU always have one to execute.

What are the benefits of multithreads?

Responsiveness, Resource sharing, Economy, Scalability.

Define mutual exclusion.

If one process is executing in its critical section, then no other processes can be executing in their critical sections.

Give the necessary conditions for deadlock to occur.

Deadlock can arise if four conditions hold simultaneously. (All four must hold)

- **Mutual exclusion**: only one process at a time can use a resource.
- **Hold and wait**: a process holding at least one resource is waiting to acquire additional resources held by other processes.
- **No preemption**: a resource can be released only voluntarily by the process holding it, after that process has completed its task.
- **Circular wait:** there exists a set $\{P_0, P_1, ..., P_n\}$ of waiting processes such that P_0 is waiting for a resource that is held by P_1, P_1 is waiting for a resource that is held by P_2, ..., P_{n-1} is waiting for a resource that is held by P_n, and P_n is waiting for a resource that is held by P_0.

Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the logical address and in the physical address.

a) Logical Address Space is

8 Pages	1024 words

To address 8 pages we need 3 bits

To address 1024 words we need 10 bits

Total bits needed to address Logical address space is 13 bits

b) Physical Address Space

32 Frames	1024 words

To address 32 Frames we need 5 bits

To address 1024 words we need 10 bits

Total bits needed to address Physical address space is 15 bits

6. **What is meant by Belady's anomaly?**

In some cases it has been found that the number of page fault is not directly proportional to the number of frames. This unexpected result is known as Belady's anomaly.

7. **What are the responsibilities of File Manager?**

File manager is responsible for the maintenance of secondary storage.

8. **Mention the two main approaches to identify and reuse free memory area in a heap.**

Bit Vector, linked list.

9. **Define rotational latency.**

The rotational latency is the additional time waiting for the disk to rotate the desired sector to the disk head.

10. **Write a brief note on RAID.**

Redundant Array of Inexpensive (or "Independent") Disks is a series (RAID0 to RAID5) of increasing reliable and expensive ways of organising multiple physical hard disks into groups ("arrays") that work as a single logical disk. Each logical drive appears to the operating system as a single physical drive, thanks to the efforts of the RAID controller. There are hardware and software RAID controllers, but the software version adds strain to the CPU and is slower than a hardware controller.

PART B — (5 x 16 = 80 marks)

11. (a) (i) **Discuss multiprocessor systems in detail.** (8)

Refer section 1.4

(ii) **Explain the purpose and importance of system calls in detail with examples.** (8)

Refer section 2.3

(b) Discuss how communication is done in client server systems using remote procedure calls and remote method invocation. (16)

Refer section 1.5.1 & 1.5.2

2. (a) Discuss the different techniques used for evaluating CPU scheduling algorithms in detail. (16)

Refer section 3.7.5

(b) (i) What is meant by critical section problem? Propose a solution based on bakery algorithm. (8)

Refer section 4.2 & 4.2.2

(ii) Consider the following snapshot of a system:

PO — P4 are 5 processes present and A, B, C, D are the resources. The maximum need of a process and the allocated resources details are given in the table.

Answer the following based on banker's algorithm. Each subdivision carries two marks.

(1) What is the content of NEED matrix? (2)

(2) Is the system in a safe state? (3)

(3) If a request from process PO arrives for (0, 2, 0) can the request be granted immediately. (3)

	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			
P4	0	0	2	4	3	3			

- Consider a system with five processes P_0 through P_4 and three resource types A,B,C. A(7 instances) B(2 instances) C (6 instances).
- At time T_0 The following are the resource-allocation state:

	Allocation	Request	Available
	ABC	ABC	ABC
P_0	010	000	000
P_1	200	202	
P_2	303	000	
P_3	211	100	

P_4	002	002

- Sequence $< P_0, P_2, P_3, P_1, P_4 >$ will result in *Finish*[i] = true for all i.
- P_2 requests additional resource type C, The *Request* matrix is modified as follows:

	ABC
P_0	000
P_1	202
P_2	001
P_3	100
P_4	002

We claim that the system is now deadlocked. Although we can reclaim the resources held by process P_0, the number of available resources is not sufficient to fulfill the requests of the other processes. Thus, a deadlock exists, consisting of processes P_1, P_2, P_3, and P_4

13. (a) (i) **Explain the concept of paging in detail with necessary diagrams.** (8)

Refer section 6.4, 6.4.1, 6.4.2

(ii) **Describe the hierarchical paging technique for structuring page tab** (8)

Refer section 6.4.3

(b) (i) **Consider the following page reference string :**

2, 1, 0, 3, 4, 0, 0, 0, 2, 4, 2, 1, 0, 3, 2. How many page faults would occur if the working set policy were used with a window size of 4? Show when each page fault would occur clearly. (4)

Refer section 7.6.2

(ii) **What is meant by thrashing? Discuss in detail.** (12)

Refer section 7.6 & 7.6.1

14. (a) (i) **Explain the different file access methods in detail.** (8)

Refer section 8.5

(ii) **Describe the two level and acyclic graph schemes for defining the log structure of a directory.** (8)

Refer section 8.6.2 & 8.6.4

(b) (i) **Explain the linked list and indexed file allocation methods with neat diagrams. Mention their advantages and disadvantages.** (8)

Refer section 9.4.2 & 9.4.3

(ii) **Discuss how free space is managed by operating system?** (8)

Refer section 9.5.1 to 9.5.4

15. (a) (i) **Write a brief note on interrupts.**

Refer section 10.1.3

(ii) **Explain the special services provided by kernel I/O subsystem.**

Refer section 10.3.1 to 10.3.4

(b) (i) **Describe the different disk scheduling algorithms with examples.**

Refer section 10.7.1 to 10.7.5

(ii) **Write a brief note on RAID levels.**

Refer section 10.10

Question Papr Code : 31304

B.E./ B. TECH. DEGREE EXAMINATION, NOV / DEC 2013

Fourth Semester

Computer Science and Engineering

CS 2254/CS 45 / CS 1253/10144 CS 405 / 080250012 – OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008/2010)

(Common to PTCS 2254 - Operating Systems for B.E. (Part-Time) Fourth semester CSE-Regulation 2009)

Time : Three hours Maximum: 100 marks

Answer ALL questions

Part A - (10 x 2 = 20 marks)

1. **Define Operating Systems. List out the functions of Operating Systems.**

An operating system is a program that manages the computer hardware. It provides a basis for application programs and acts as an intermediary between a user of a computer and the computer hardware.

A computer system can be divided into four components :

(i) Hardware

(ii) Operating System

(iii) Application Programs

(iv) Users

2. **Describe the actions taken by a Kernel to context-switch between processes.**

In general, the operating system must save the state of the currently running process and restore the state of the process scheduled to be run next. Saving the state of a process typically includes the values of all the CPU registers in addition to memory allocation. Context switches must also performmany architecture-specific operations, including flushing data and instruction caches.

3. **What is turnaround time?**

Turn around time - amount of time to execute a particular process.

4. **State the four necessary condition for a deadlock situation to arise.**

- **Mutual exclusion**: only one process at a time can use a resource.
- **Hold and wait**: a process holding at least one resource is waiting to acquire additional resources held by other processes.

- **No preemption**: a resource can be released only voluntarily by the process holding it, after that process has completed its task.
- **Circular wait:** there exists a set $\{P_0, P_1, ..., P_n\}$ of waiting processes such that P_0 is waiting for a resource that is held by P_1, P_1 is waiting for a resource that is held by P_2, ..., P_{n-1} is waiting for a resource that is held by P_n, and P_n is waiting for a resource that is held by P_0.

Compare swapping and overlays.

Overlays:

Overlays is to keep in memory only those instructions and data that are needed at any given time.

- When other instructions are needed, they are loaded into space that was occupied previously by instructions that are no longer needed.
- Overlays are implemented by user, no special support needed from operating system, programming design of overlay structure is complex.

Swapping :

A process can be swapped temporarily out of memory to a backing store, and then brought back into memory for continued execution.

- Backing store - fast disk large enough to accommodate copies of all memory images for all users; must provide direct access to these memory images.
- Roll out, Roll in - Swapping variant used for priority-based scheduling algorithms; lower-priority process is swapped out so higher-priority process can be loaded and executed.
- Normally, a process that is swapped out will be swapped back into the same memory space that it occupied previously.

Differentiate external fragmentation with internal fragmentation.

Internal Fragmentation is the area in a region or a page that is not used by the job occupying that region or page. This space is unavailable for use by the system until that job is finished and the page or region is released.

Define FAT.

FAT – File Allocation Table. This table has one entry for each disk block and is indexed by block number.

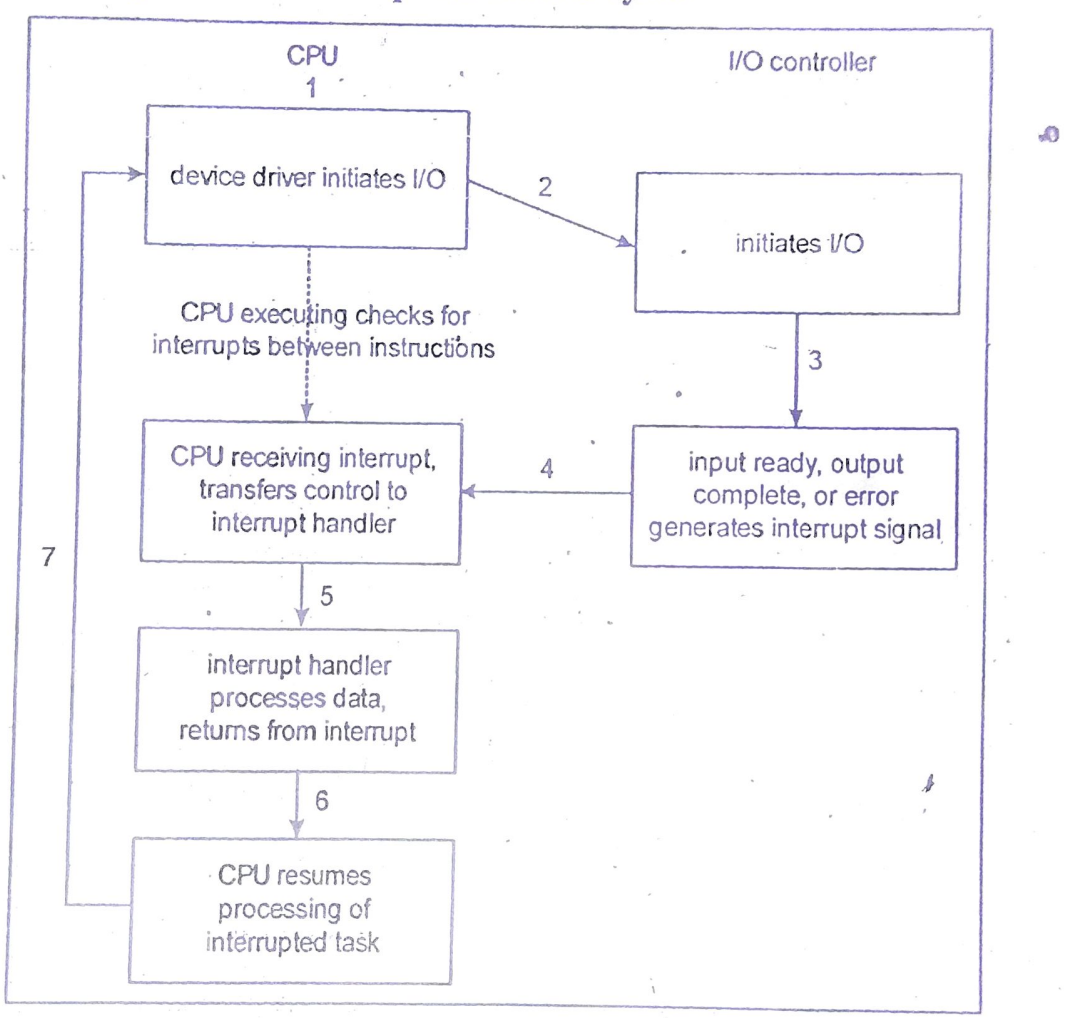
What is Relative Block Number?

Relative block number is the index related with beginning of the file.

9. **What is double buffering?**

A slow device may write data into a buffer, and when the buffer is full, the entire buffer is sent to the fast device all at once. So that the slow device still has somewhere to write while this is going on, a second buffer is used, and the two buffers alternate as each becomes full. This is known as **double buffering.** (Double buffering is often used in (animated) graphics, so that one screen image can be generated in a buffer while the other (completed) buffer is displayed on the screen. This prevents ths user from ever seeing any half-finished screen images.)

10. **Draw the diagram for interrupt driven I/O cycle.**



PART B — (5 x 16 = 80 marks)

11. (a) (i) **List out the various process states and briefly explain with a state diagram.** (8)

Refer section 3.1

(ii) **Define thread, its benefits and the models of multithreading.** (8)

Refer section 3.6.1 & 3.6.7

(b) (i) What is a virtual machine? List out the advantages of virtualization. Explain the creation of a Virtual machine with architecture diagram. (8)

Refer section 2.6 & 2.7

(ii) Explain the operating systems structures. (8)

Refer section 2.5

(a) (i) How does a deadlock can be avoided using Banker's algorithm? (8)

Refer section 5.6.2

(ii) Discuss in detail the critical section problem and also write the algorithm for Readers-Writers problem with semaphores. (8)

Refer section 4.2 & 4.5.2

(b) Explain the difference in the degree to which FCFS, UK and Non-preemptive SJF scheduling algorithms, discriminate in favour of short process. (16)

Refer section 3.7.5

(a) (i) Explain any two, page replacement algorithms. (8)

Refer section 7.4.2 & 7.4.3

(ii) Explain the concept of demand paging and the performance issue of demand paging. (8)

Refer section 7.2.1 to 7.2.2

(b) Explain the principles of segmented and paged implementation of memory with a diagram. (10)

(a) (i) Explain why logging metadata updates ensures recovery of a file system after a file-system crash. (8)

Refer section 9.7

(ii) Describe the different mechanisms used to protect a file. (8)

Refer section 8.9

(b) (i) Write short note on Linux file system. (8)

Refer section 9.8

(ii) Explain different directory implementation methods. (8)

Refer section 9.3.1 & 9.3.2

(a) Why disk scheduling is necessary? Explain the different, seek optimization techniques. (16)

Refer section 10.7 & 10.7.1 to 10.7.5

(b) Explain briefly about the levels of RAID. (10)

Refer section 10.10

(Question Paper Code : 51362)

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Seventh Semester

Electrical and Electronics Engineering

CS 2411/CS 609/10144 CS 405 — OPERATING SYSTEMS

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 x 2 = 20 marks)

1. **What are system calls? Give their major categories.**

System calls provide the interface between a running program and the operating system.

- System calls can be roughly grouped into five major categories:
- process control: end, execute, wait, fork (create process), allocate and free memory etc.
- file manipulation: create/delete file, open/close, read/write, get/set attributes
- device manipulation: request/release, read/write, get/set attributes
- information maintenance: get/set time/date, get process info.
- comunications: create/delete connections, send/receive msgs

2. **What are the reasons for providing process cooperation?**

Processes cooperate by sharing data. Cooperation is important for several reasons:

- ***Information sharing:*** Several processes may need to access the same data (such as stored in a file.)
- ***Computation speedup:*** A task can ofter be run faster if it is broken into subtasks and distributed among different processes. For example, the matrix multiplication code we saw in class. This depends upon the processes sharing data. (Of course, real speedup also required having multiple CPUs that can be shared as well.) For another example, consider a webserver which may be serving many clients. Each client can have their own process or thread helping them. This allows the server to use the operating system to destribute the computer's resources, including CPU time, among the many clients.
- ***Modularity:*** It may be easier to organize a complex task into separate subtasks, then have different processes or threads running each subtask. For example, a single server process dedicated to a single client may have multiple threads running--each performing a different task for the client.

- *Convenience:* An individual user can run several programs at the same time, to perform some task. For example, a network browser is open, while the user has a remote terminal program running (such as telnet), and a word processing program editing data.

List out any four scheduling criteria.

Four scheduling criteria

- FCFS scheduling
- Round robin scheduling
- SJF scheduling
- SRT scheduling

What is a safe state?

The working set model states that a process can be in RAM if and only if all of the pages that it is currently using (often approximated by the most recently used pages) can be in RAM. The model is an all or nothing model, meaning if the pages it needs to use increases, and there is no room in RAM, the process is swapped out of memory to free the memory for other processes to use.

What is a working-set model?

When a process requests an available resource, system must decide if immediate allocation leaves the system in a safe state

- System is in safe state if there exists a safe sequence of all processes.
- Sequence <P1, P2? Pn> is safe if for each Pi, the resources that Pi can still request can be satisfied by currently available resources + resources held by all the Pj, with j<I.

If Pi resource needs are not immediately available, then Pi can wait until all Pj have finished.

When Pj is finished, Pi can obtain needed resources, execute, return allocated resources, and terminate.

When Pi terminates, Pi+1 can obtain its needed resources, and so on.

How the problem of external fragmentation can be solved?

Reduce external fragmentation by compaction

- Shuffle memory contents to place all free memory together in one large block
- Compaction is possible only if relocation is dynamic, and is done at execution time.

What are the attributes of files?

File attributes are : Name, identifier,type location, size, protection, time, date and user identification.

8. Define log structured file.

A log-structured filesystem is a file system in which data and metadata are writt sequentially to a circular buffer, called a log.

9. Give the various Disk scheduling methods.

Disk scheduling methods

- FCFS scheduling
- SSTF scheduling
- SCAN scheduling
- LOOK scheduling
- C-SCANscheduling

10. What is meant by RAID?

RAID stands for redundant array of independent disks. The technology combines tw or more physical drives into a logical unit presented as a single hard drive to th operating system. Mirroring is duplicating data to more than one disk.

PART B — (5 x 16 = 80 marks)

11. (a) Give a detailed description of the System structure of Modern operatin system. (16)

Refer section 2.1

(b) (i) Explain the various operations on processes. (10)

Refer section 3.3.1 & 3.3.2

(ii) Give a short note on threading issues. (6)

Refer section 3.6.8

12. (a) Explain the various CPU scheduling algorithms with example. (16)

Refer section 3.7.5

(b) (i) Describe the ways of implementing semaphores. (8)

Refer section 4.4

(ii) Explain in detail about the methods for Deadlock detection. (8)

Refer section 5.7

13. (a) (i) Elaborate on inverted page tables and their use in paging and segmentation. (8)

Refer section 7.4.3 (only inverted page table should be copied)

(ii) Explain in detail about the segmentation and implementation of Segment tables. (8)

Refer section 6.5

(b) What is demand paging? Describe the process of demand paging in OS.(16)

Refer section 7.2

(a) (i) Describe File structure, File attributes and file operations in detail.(10)

Refer section 8.1 to 8.3

(ii) Write a note on free space management of file system. (6)

Refer section 9.5

(b) (i) Describe the two level.and tree type Directory structures in detail. (8)

Refer section 8.6.1 & 8.6.2

(ii) Explain File system in Linux in detail. (8)

Refer section 9.8

(a) (i) Explain the Application I/O Interface in detail. (10)

Refer section 10.2

(ii) With a neat sketch explain the structure of streams. (6)

Refer section 10.4

(b) (i) Explain the RAID Levels and problems associated with RAID. (10)

Refer section 10.10

(ii) Describe the Tertiary storage devices. (6)

Refer section 10.13

Question Paper Code : 91346

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014

Fourth Semester

Computer Science and Engineering

CS 2254/ CS 45/ CS 1253/ 080250012/10144 CS 405 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008 / 2010)

(Common to PTCS 2254110144 CS 405 — Operating Systems for B.E. (Part-Time) Fourth Semester - CSE - Regulation 2009 / 2010)

Time: Three hours

Maximum : 100 mark

Answer ALL questions.

PART A — (10 x 2 = 20 marks)

1. **What is the resident set and working set of a process?**

   Resident set is that portion of the process image that is actually in real-memory at particular instant. Working set is that subset of resident set that is actually needed fo execution.

2. **What resources are used when a thread created?**

   When a thread is created the threads does not require any new resources to execute th thread shares the resources like memory of the process to which they belong to. Th benefit of code sharing is that it allows an application to have several different thread of activity all within the same address space.

3. **Differentiate between pre-emptive and non-pre-emptive scheduling.**

   A preemptive scheduler interrupts a thread of execution when its time slice runs out. A non-preemptive (or "cooperative") scheduler waits for the thread to yield control.

4. **What can the operating system do to recover from deadlock?**

   Some systems facilitate deadlock recovery by implementing checkpointing and rollback Checkpointing is saving enough state of a process so that the process can be restarted at the point in the computation where the checkpoint was taken. Autosaving file edits is a form of checkpointing. Checkpointing costs depend on the underlying algorithm Very simple algorithms (like linear primality testing) can be checkpointed with a few words of data. More complicated processes may have to save all the process state and memory.

   Checkpoints are taken less frequently than deadlock is checked for. If a deadlock is detected, one or more processes are restarted from their last checkpoint. The process of restarting a process from a checkpoint is called rollback. The hope is that the resource requests will not interleave again to produce deadlock.

   Deadlock recovery is generally used when deadlocks are rare, and the cost of recovery (process termination or rollback) is low.

What is the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? The block size is 512 bytes. Disk block numbers can be stored in 4 bytes.

We have, block size = 512

number of block numbers in an indirection block

= block size / 4

= 128

number of blocks for file data in that file object

= 16 + 128 + 128^2 + 128^3

Maximum file size:

(direct + single indirect + double indirect + triple indirect) * (blocksize)

= (16 + 512/4 + (512/4)^2 + (512/4)^3) * (512)

= 68853964800 bytes, ~64 gigs

List the steps needed to perform page replacement.

The steps needed to perform page replacement are:

1. Determine which page is to be removed from the memory.
2. Perform a page-out operation.
3. Perform a page-in operation.

What file access pattern is particularly suited to chained file allocation on disk?

Sequencial file access is suited to chained file allocation.

What file allocation strategy is most appropriate for random access files?

Indexed allocation is appropriate for random access, as there is a constant time (slowing down very slightly with increased indirection levels), for accessing any part of the file.

Compare bitmap-based allocation of blocks on disk with a free block list.

Managing disk free space: many early systems just used a linked list of free blocks.

a. At the beginning, free list is sorted, so blocks in a file are allocated contiguously.
b. Free list quickly becomes scrambled, so files are spread all over disk.

BSD approach to free space: *bit map*:

c. Keep an array of bits, one per block.
d. 1 means block is free, 0 means block in use
e. During allocation, search bit map for a block that's close to the previous block of the file.
f. If disk isn't full, this usually works pretty well.
g. If disk is nearly full this becomes very expensive and doesn't produce much locality.
h. Solution: don't let the disk fill up!
   i. Pretend disk has 10% less capacity then it really has
   ii. If disk is 90% full, tell user it's full and don't allow any more data to be written.

10. **What is an I/O buffer?**

Input/output (I/O) buffering is a mechanism that improves the throughput of input and output operations. It is implemented directly in hardware and the corresponding drivers (hence the block devices found in Unix-like systems), and is also ubiquitous among programming language standard libraries.

PART B — (5 x 16 = 80 marks)

11. (a) (i) **Draw the state diagram of a process from its creation to termination, including All transitions, and briefly elaborate every state and every transition.** (8)

Refer section 2.9

(ii) **What are threads? Why are they required? Discuss the differentiate between Kernel level and user level threads.** (8)

Refer section 3.6.2 to 3.6.5

(b) (i) **What are interacting processes? Explain any two methods of implementing interacting processes.** (8)

Refer section 3.4 & 3.5

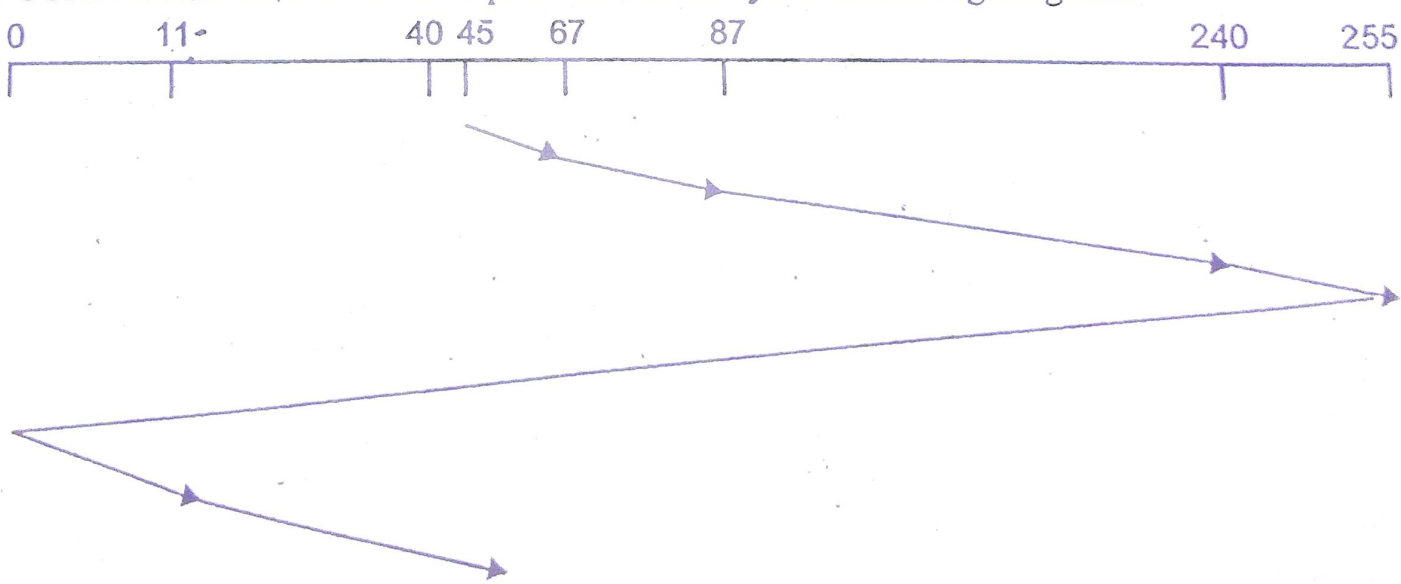
(ii) **Explain in detail about the different Multi threading models with neat diagram.** (8)

Refer section 3.6.7

12. (a) (i) **Consider the situation in which the disk read/write head is currently located at Track 45 (of tracks 0-255) and moving in the positive direction. Assume that the Following track requests have been made in this order: 40, 67, 11, 240, 87. What is the order in which optimized C-SCAN would service these requests and what is the total seek distance?** (8)

Disk Queue :

40, 67, 11, 240, 87 and disk is currently located at track 45. The order in which optimised C-SCAN would service these requests is shown by the following diagram.



Total seek distance = (67–45) + (87–67)+(240–87) + (255–240) + 255 + (11–0)+(40–11)

= 22 + 20 + 153 + 15 + 255 + 11 + 29

= 505

(ii) **Explain any three policies for process scheduling that uses resource consumption information. What is response ratio?** (8)

Refer section 3.7.5

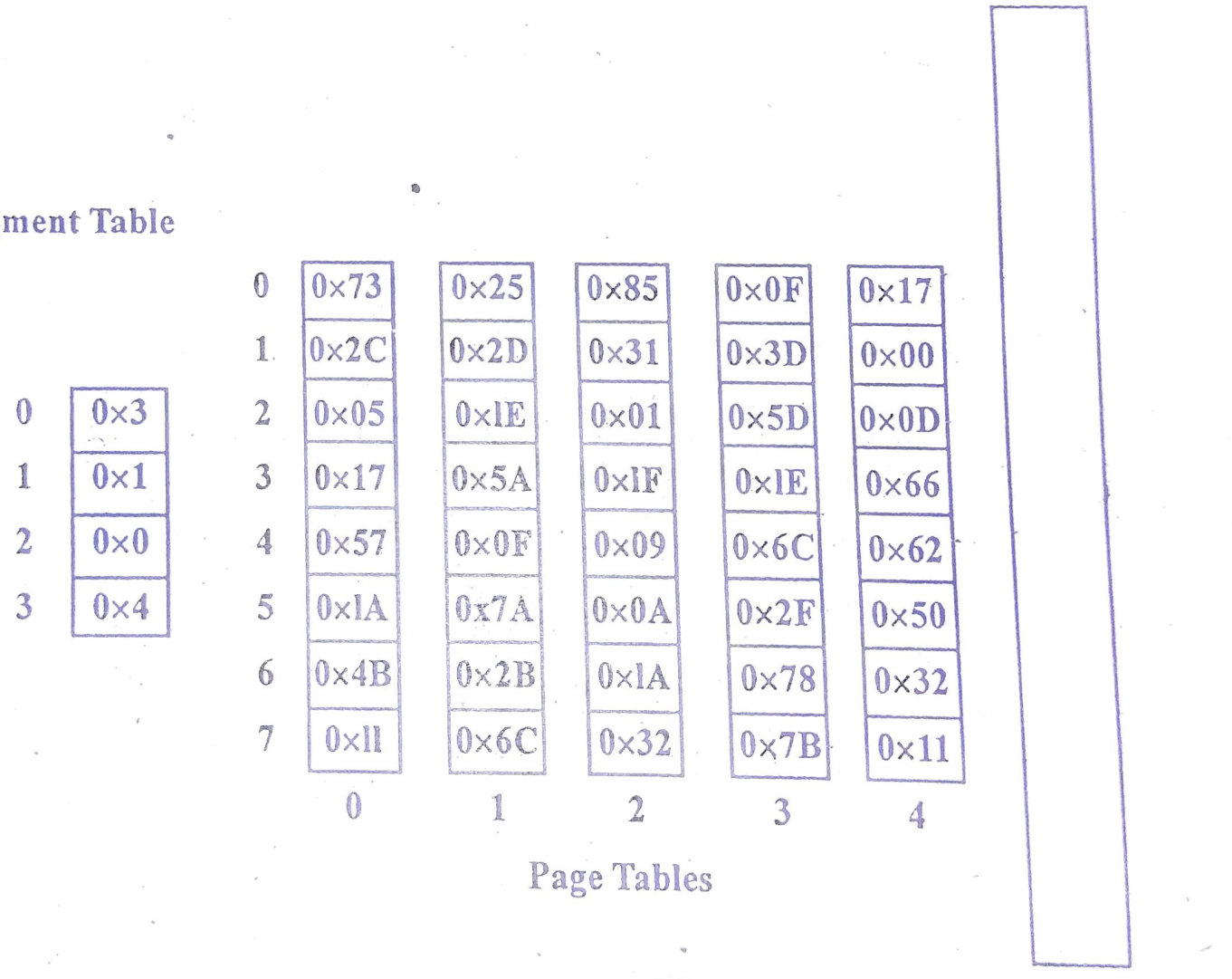
(b) (i) **What are semaphores? How do they implement mutual exclusion?** (8)

Refer section 4.4

(ii) **Give a solution for readers-writers problem using conditional critical regions.** (8)

Refer section 4.5.2

13. (a) **Consider the following segmented paging memory system. There are 4 segments for the given process and a total of 5 page tables in the entire system. Each page table has a total of 8 entries. The physical memory requires 12 bits to address it; there are a total of 128 frames.**



(i) **How many bytes are contained within the physical memory?**

(ii) **How large is the virtual address?**

(iii) What is the physical address that corresponds to virtual address 0×312?

(iv) What is the physical address that corresponds to virtual address 0×1E9? **(16)**

(i) Number of bytes in physical memory is equal to 2 ^(7 + 7) = 16K bytes. This is because 12 bits are required to address physical memory location out of which 3 bits are to refer frame no. within page table + 2 bits to locate page from segment and remaining 7 bits for offset with frame.

(ii) The size of virtual memory is 2 ^ 20 (20 = 2 for segment index, + 3 for page table index + 3 for frame index in page table + 7 for frame number and 5 for offset within frame).

(iii) 312 (Hex) = 001100010010 = 00 (segment) in table number 3 (refer to the data in question at entry 0 in segment table then find page 3, in page 3 find 110 (6th entry which is 78; that is 120 th frame then the offset with the frame is given by the last 7 bits 0010010.

(iv) 312 (Hex) = 001100010010 = 00 (segment) in table number 3 (refer to the data in question at entry 0 in segment table then find page 3, in page 3 find 110 (6th entry which is 78; that is 120 th frame then the offset with the frame is given by the last 7 bits 0010010.

(b) Explain with the help of examples FIFO and LRU page replacement algorithms. (16)

Refer section 7.4.2 & 7.4.4

14. (a) (i) Explain in detail about File system Implementation. (6)

Refer section 9.2

(ii) A file system on a disk has both logical and physical block sizes of 51 bytes. Assume that the information about each file is already in memory using contiguous, linked, and indexed allocation strategies answer the following questions : (10)

(1) How is the logical-to-physical address mapping accomplished in this system? (For the indexed allocation, assume that a file is always less than 512 blocks long).

(2) If we are currently at logical block 10 (the last block accessed was block and want to access logical block 4, how many physical blocks must be read from the disk?

Let Z be the starting file address (block number).

a. *Contiguous:* Divide the logical address by 512 with X and Y the resulting quotient and remainder respectively.

i. Add X to Z to obtain the physical block number. Y is the displacement into the block.

ii. 1

Linked: Divide the logical physical address by 511 with X and Y the resulting quotient and remainder respectively.

i. Chase down the linked list (getting X + 1 blocks). Y + 1 is the displacement into the last physical block.

ii. 4

Indexed: Divide the logical address by 512 with X and Y the resulting quotient and remainder respectively.

i. Get the index block into memory. Physical block address is contained in the index block at location X. Y is the displacement into the desired physical block.

ii. 2

(b) (i) Discuss the different techniques with which a file can be shared among different users. (8)

Refer section 8.8

(ii) What is File protection and security? Compare both and also Explain the techniques to protect user files. (8)

Refer section 8.9

15. **(a) (i) Describe three circumstances under which blocking I/O should be used. Describe three circumstances under which nonblocking I/O should be used. Why not just implement nonblocking I/O and have processes busy-wait until their device is ready?** (8)

Refer section 10.2.4

(ii) What is disk management? Explain in detail how to improve the disk Performance. (8)

Refer section 10.8

(b) Explain the following :

(i) What is RAID? Describe its types with proper example. (8)

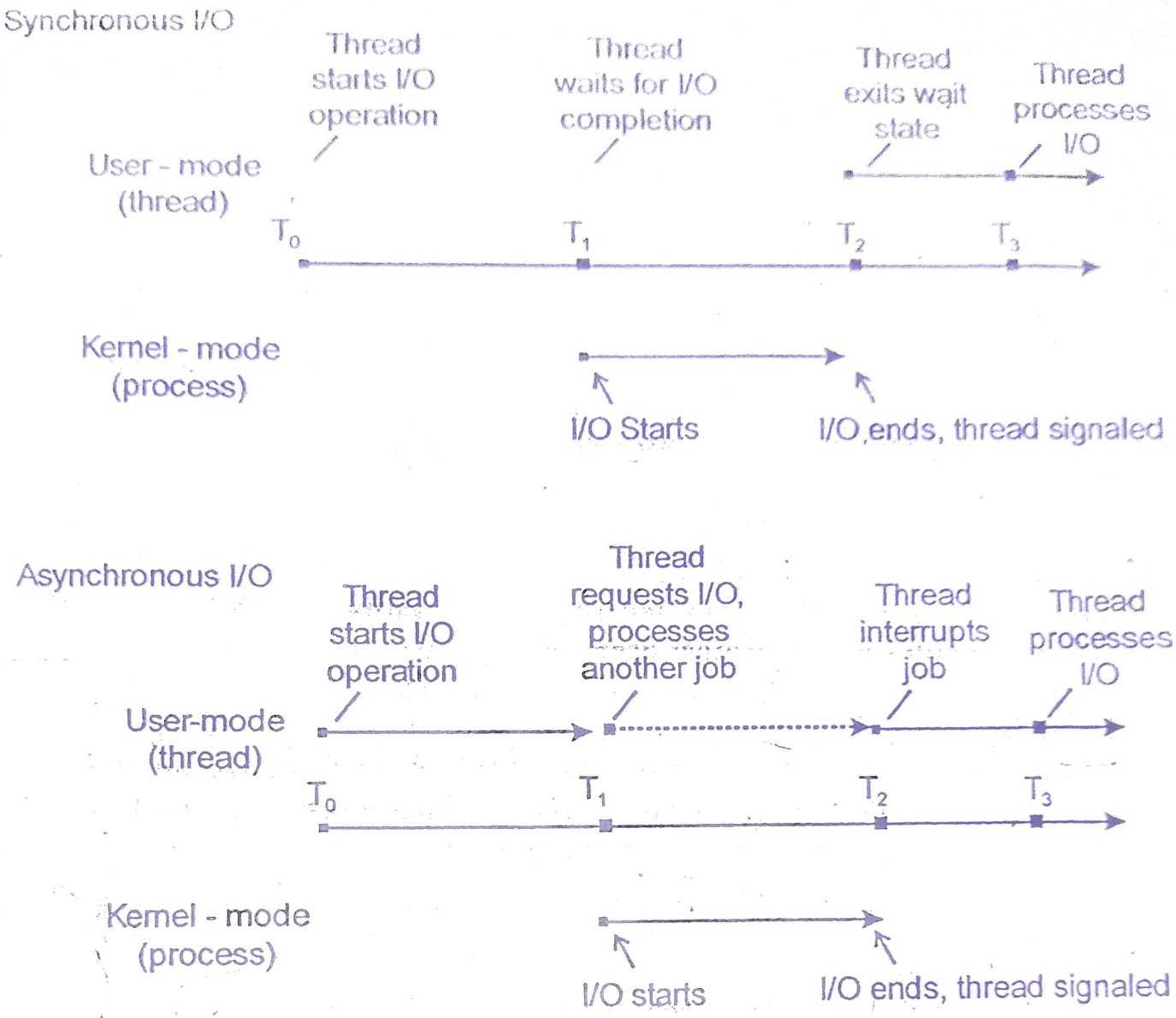
Refer section 10.10

(ii) Compare synchronous and asynchronous input / output with the help of an example. (8)

There are two types of input/output (I/O) synchronization: synchronous I/O and asynchronous I/O. Asynchronous I/O is also referred to as overlapped I/O.

In *synchronous file* I/O, a thread starts an I/O operation and immediately enters a wait state until the I/O request has completed. A thread performing asynchronous file I/O sends an I/O request to the kernel by calling an appropriate function. If the request is accepted by the kernel, the calling thread continues processing another job until the kernel signals to the thread that the I/O operation is complete. It then interrupts its current job and processes the data from the I/O operation as necessary.

The two synchronization types are illustrated in the following figure.



In situations where an I/O request is expected to take a large amount of time, such as refresh or backup of a large database or a slow communications link, asynchronous I/O generally a good way to optimize processing efficiency. However, for relatively fast I/ operations, the overhead of processing kernel I/O requests and kernel signals may mal asynchronous I/O less beneficial, particularly if many fast I/O operations need to be made. this case, synchronous I/O would be better. The mechanisms and implementation details how to accomplish these tasks vary depending on the type of device handle that is used ar the particular needs of the application. In other words, there are usually multiple ways solve the problem.

Question Paper Code : 51344

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Fourth Semester

Computer Science and Engineering

CS 2254/CS 45/CS 1253/080250012/10144 CS 405 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008/2010)

(Also Common to PTCS 2254 – Operating Systems for B.E. (Part-Time) Fourth Semester Computer Science and Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Can multiple user level threads achieve better performance on a multiprocessor system than a single processor system? Justify your answer.

2. Mention the circumstances that would a user be better off using a time-sharing system rather than a PC or a single user workstation?

3. Write the four situations under which CPU scheduling decisions take place.

4. Show that mutual exclusion may be violated if the signal and wait operations are not executed atomically.

5. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. Find the number of bits in the logical address and the physical address.

6. Define virtual memory.

7. List the attributes of a file.

8. What are the information contained in a boot control block and partition control block?

9. What is meant by polling?

10. State any three disadvantages of placing functionality in a device controller, rather than in the kernel.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the purpose of system calls and discuss the calls related to device management and communications in brief. (8)

(ii) Discuss the different multithreading models along with their issues. (8)

Or

(b) (i) Explain the concept of virtual machines, their implementation and benefits in detail . (8)

(ii) Discuss the execution of remote procedure call and remote method invocation with supporting diagrams. (8)

12. (a) Discuss how scheduling algorithms are selected for a system. What are the criteria considered? Explain the different evaluation methods. (16)

Or

(b) Consider the following snapshot of a system:

P0 — P4 are 5 processes present and A, B, C, D are the resources. The maximum need of a process and the allocated resources details are given in the table.

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following based on banker's algorithm

(i) What is the content of NEED matrix? (6)

(ii) Is the system in a safe state? (2)

(iii) Which processes may cause deadlock if the system is not safe. (3)

(iv) If a request from process P1 arrives for (0,4,3,1) can the request be granted immediately? Justify. (5)

(a) (i) Why are translation look-aside buffers important? Explain the details stored in a TLB table entry. (8)

(ii) Explain the concept of demand paging in detail with neat diagrams. (8)

Or

(b) (i) Explain any two structures of the page table with neat diagrams. (8)

(ii) Consider the following page reference string:

1, 2, 3, 4, 2, 1, 5, 6, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the LRU, FIFO, LFU and Optimal page replacement algorithms, assuming two and five frames? (8)

(a) (i) Explain the common schemes for defining the logical structure of a directory. (8)

(ii) Explain how file system management is done in Linux. (8)

Or

(b) (i) Explain the different file access methods in detail. (8)

(ii) Discuss how file system is implemented in Windows XP. (8)

(a) (i) Write a brief note on the steps involved in DMA transfer. (8)

(ii) Explain the data structures supported by kernel I/O subsystem? (8)

Or

(b) (i) Describe any three disk scheduling algorithms with suitable illustrations. (12)

(ii) Write a brief note on tertiary storage devices. (4)

Question Paper Code : 21382

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fourth Semester

Computer Science and Engineering

CS 2254/CS 45/CS 1253/080250012/10144 CS 405 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulations 2008/2010)

(Common to PTCS 2254/10144 CS 405 – Operating Systems for B.E. (Part-Time) Fourth Semester – CSE – Regulations 2009/2010)

me : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

What are the different states in which and when a process can exist?

Define thread. How is it related to a process?

Define any four scheduling criteria used to compare the scheduling algorithms

What is race condition?

What is meant by address binding? Mention the different types.

What is virtual memory? Mention its advantages.

What is file? Mention some important file attributes.

What is meant by free space management? Mention the various techniques used.

Differentiate between SCAN and LOOK disk scheduling.

What is the use of inode?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define operating system. Explain the main functions of an operating system. (8)

(ii) Describe the essential properties for the multiprocessor and real-time operating systems. (8)

Or

(b) (i) Describe the inter process communication in client-server systems. (8)

(ii) Explain the issues in threading. (8)

12. (a) (i) Differentiate preemptive scheduling from non-preemptive scheduling. (4)

(ii) Explain FCFS, SJF, non-preemptive priority and RR (time slice = 3) scheduling algorithms by considering five processes with burst time and priority. Compare the turnaround and waiting times of each process for each of the above scheduling algorithms. (12)

Or

(b) (i) Define semaphore. Explain the use of semaphores in synchronization problem with an example. (6)

(ii) What is deadlock? How deadlock can be avoided using Banker's algorithm. Explain with an illustration. (10)

13. (a) (i) Explain how virtual address is mapped to physical address in paging, with the hardware support required. (8)

(ii) Define thrashing. Explain the cause for thrashing. (4)

(iii) What is meant by Belady's anomaly? Briefly explain with an example. (4)

Or

(b) Explain the various page replacement algorithms with an example reference string. Mention their merits and demerits. (16)

14. (a) (i) List and explain the three common ways by which files can be structured. (6)

(ii) Explain Linux file system in detail. (10)

Or

(b) (i) What is the role of Access matrix for protection? Explain. (6)

(ii) Explain Windows XP file system in detail. (10)

(a) Assume the head of a moving disk with 200 tracks, numbered 0...199, is currently serving a request at track 92, and has just finished a request at track 85 and the queue request is kept in the FIFO order, 109, 148, 89, 72, 126 and 142. What is the total head movement needed to satisfy these requests for the SCAN, C-SCAN, LOOK and C-LOOK disk scheduling algorithms? (16)

Or

(b) (i) Explain the RAID. (6)

(ii) Define swapping. Describe how swap space is managed by an operating system. (10)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 77098

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fourth Semester

Computer Science and Engineering

CS 6401 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Do timesharing differs from Multiprogramming? If so, How?
2. Why API's need to be used rather than system calls?
3. List out the data fields associated with Process Control Blocks.
4. Define the term 'Dispatch Latency'.
5. What do you mean by 'Thrashing'?
6. Mention the significance of LDT and GDT in Segmentation.
7. List out the major attributes and operations of a file.
8. What is HSM? Where it is used?
9. Do FAT file system is advantageous? Why?
10. What is the responsibility of kernel in LINUX Operating system?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss about the evolution of Virtual Machines. Also explain how virtualization could be implemented in operating systems. (10)

(ii) Sketch the structure of Direct Memory Access in detail. (6)

Or

(a) (i) Explain the various types of System calls with an example for each. (10)

(ii) Discuss about the functionality of System boot with respect to operating system. (6)

12. (a) (i) Explain the FCFS, preemptive and non preemptive versions of Shortest-Job-First and Round Robin (time slice = 2) scheduling algorithms with Gantt Chart for the four processes given. Compare their average turn around and waiting time. (12)

Process	Arrival Time	Burst Time
P1	0	10
P2	1	6
P3	2	12
P4	3	15

(ii) Discuss how deadlocks could be detected in detail. (4)

Or

(b) (i) Show how wait( ) and signal( ) semaphore operations could be implemented in multiprocessor environments, using the Test and Set( ) instruction. The solution should exhibit minimal busy waiting. Develop Pseudocode for implementing the operations. (10)

(ii) Discuss about the issues to be considered with multithreaded programs. (6)

13. (a) Consider the following page reference string 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 4, 5, 3. How many page faults would occur for the following replacement algorithms? Assume four frames and all frames are initially empty. (16)

(i) LRU replacement

(ii) FIFO replacement

(iii) Optimal replacement.

Or

(b) (i) With a neat sketch, explain how logical address is translated into physical address using Paging mechanism. (10)

(ii) Write short notes on Memory mapped files. (6)

14. (a) (i) Explain about the RAID structure in disk management with various RAID levels of organization in detail. (10)

(ii) Briefly discuss about the various directory structures. (6)

Or

(b) (i) Compare the functionalities of FCFS, SSTF, CSAN, and C-LOOK disk scheduling algorithms with an example for each. (12)

(ii) Write short notes on free space management. (4)

15. (a) Explain the significance and steps involved in setting up Xen, VMware softwares on Linux Host for successful virtualization in detail. (16)

Or

(b) (i) Briefly discuss about the requirements to become a Linux System Administrator. (6)

(ii) Discuss about the steps involved in the installation of a Linux Multifunction server. (6)

(iii) Write short notes on the Linux network services. (4)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71382

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fourth Semester

Computer Science and Engineering

CS 2254/ CS 45/ CS 1253/ 080250012/ 10144 CS 405 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2008 / 2010)

(Common to PTCS 2254/ 10144 CS 405 – Operating Systems for B.E. (Part-Time) Fourth Semester – CSE – Regulation 2009 / 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the main differences between operating systems for mainframe computers and PCs.

2. What are the five major activities of an operating system in regard to file management?

3. Define preemption and non-preemption.

4. Give the necessary conditions for deadlock to occur.

5. Assume a paging system with paged table stored in memory. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?

6. Define thrashing.

7. What is meant by mounting? Give its advantage.

8. How disk free space can be managed using bit vectors? Give an example.

9. State three advantages of placing functionality in a device controller, rather in the kernel.

10. Differentiate blocking I/O and unblocking I/O.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the purpose and importance of system calls in detail with examples. (8)

(ii) Give a brief note on storage structure. (8)

Or

(b) (i) What are the components of process control block? Explain. (8)

(ii) Discuss the steps involved in process creation and process termination. (8)

12. (a) Consider the following set of processes, with the length of the CPU – burst time given in milliseconds. (16)

Process	Burst time
P1	10
P2	1
P3	2
P4	5

(i) Draw Gantt's chart illustrating the execution of these processes using FCFS, SJF and Round Robin (with quantum = 1) scheduling techniques.

(ii) Find the turn around time and waiting time of each process using the above techniques.

Or

(b) (i) Explain dining philosopher's synchronization problem and propose a solution for it. (8)

(ii) Explain the techniques used to prevent deadlock. (8)

13. (a) Explain the concept of paging and the techniques for structuring page tables in detail with necessary diagrams. (16)

Or

(b) Explain the different page replacement algorithms with neat examples. (16)

14. (a) (i) Explain file system along with its different components. (8)

(ii) Discuss the commonly used operations on file with examples. (8)

Or

(b) Explain the different file allocation methods with neat diagrams. Mention their advantages and disadvantages. (16)

5. (a) What is disk scheduling? Explain the different types of disk scheduling by giving an example. (16)

Or

(b) (i) Write a brief note on RAID systems. (8)

(ii) Compare and contrast free space management and swap space management. (8)