SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

RAMAPURAM CAMPUS, BHARATHISALAI, RAMAPURAM, CHENNAI - 600089

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

QUESTION BANK

DEGREE / BRANCH: B.TECH-CSE

IV SEMESTER

18CSC205J / OPERATING SYSTEMS

2018 Regulation

Academic Year 2021-2022 EVEN SEMESTER

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

RAMAPURAM CAMPUS, BHARATHI SALAI, RAMAPURAM, CHENNAI-600089

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

QUESTIONBANK

SUBJECT : 18CSC205J/Operating Systems

SEM/YEAR: II/IV

Course Outcomes

CLO-1 : Identify the need of an Operating system

CLO-2 : Know the Process management functions of an Operating system

CLO-3 : Understand the need of Memory Management functions of an Operating system

CLO-4 : Find the significance of Device management role of an Operating system

CLO-5 : Recognize the essentials of File Management part of an Operating system

CLO-6 :Gain an insight of Importance of an Operating system through practical

UNIT I			
Operating System Objectives and functions - Gaining the role of Operating systems - The evolution of operating system, Major Achievements - Understanding the evolution of Operating systems from early batch processing systems to modern complex systems - Process Concept– Processes, PCB - Understanding the Process concept and Maintenance of PCB by OS -Threads – Overview and its Benefits - Understanding the importance of threads - Process Scheduling : Scheduling Queues, Schedulers, Context switch - Understanding basics of Process Scheduling - Operations on Process – Process creation, Process termination - Understanding the system calls – fork(),wait(),exit() - Inter Process communication : Shared Memory, Message Passing ,Pipe() -Understanding the need for IPC - Process synchronization: Background, Critical section Problem - Understanding the race conditions and the need for the Process synchronization			
PART B (4 Marks)			
1	Illustrate the factors that usually determine the degree of Multi Programming The number of Programs residing in Primary memory. Passing of the control of the CPU rapidly between these programs. Protection of user process from one another.	CO1	BT2
2	What are the Benefits of Multi Programming? Improves the System Performance. Allows Time Sharing.	CO1	BT1

	Supports multiple simultaneous interactive users		
3	What are the types of memory? i) Internal Processor Memory ii) Primary or Main Memory iii) Secondary/Auxiliary/Backing Store are the types of memory.	CO1	BT1
4	What is Memory? A Memory is the place for storage of data & information (or) it can be Defined as the work area of the computer where the microprocessor finds its data & instructions while the computer is working.	CO1	BT1
5	Explain Off-Line Processing and On-Line Processing? Rather than the CPU reading directly from the input, copying the content into CPU AND PROCESS. Transferring the contents from the input directly on to the CPU and transferring the Processed contents onto the printer is On-Line	CO1	BT2
6	Give examples of Real Time Application Ex's are Flight Control Real Time Simulation Military Application Petroleum Refinery Process Control etc.	CO1	BT1
7	Define Real Time Systems . It is another form of OS which are used in environments where a large number of events mostly external to the computer system must be accepted and processed in a short time or within certain deadlines.	CO1	BT1
8	What is Time Sharing? Time Sharing (or Multi tasking) is a logical extension of Multi Programming. It is a form of Multi Programmed OS which operates in an interactive mode with Quick response time	CO1	BT1
9	What is Asymmetric Multi Processing? It is one in which each processor is assigned a specific task. A Master Processor controls the system and the other Processors are allocated work by the Master Processor.	CO1	BT1
10	What is the advantage of Multi Processing Systems? A Multi Processing System is one in which there are more than one CPU, interleaved with each other. So it helps in improving the amount of work done.	CO1	BT1
11	How does a process differ from a job? A process is an active entity with a program counter specifying the next instructions to execute and a set to associated resources, whereas a batchSystem executes jobs.(which is a collection of processes).	CO1	BT1
12	What are the information contained in a PCB? A PCB contains pieces of information associated with a specific process, Namely	CO1	BT1

	Identifier process state program counter Context data CPU scheduling information Memory management information Accounting information I/O status information		
13	What are the operations on process? a.create a process b.destroy a process c.suspend a process d.resume a process e.change the priority of a process f.block a process g.wakeup a process h.dispatch a process i.enable a process to communicate with another	CO1	BT1
14	Elaborate the function of the ready queue? The ready queue stores threads that aren't currently running, that are capable of resuming execution. There may be several ready queues for each priority level, depending on the scheduling algorithm. The scheduler consults the ready queue to determine which process/thread to run next. As the name suggests, the ready queue is a *queue,* in order to schedule fairly.	CO1	BT1
15	What is the relationship between threads and processes? A processes is a container for threads, which has it's own memory space. A process may contain one or more threads, which share that memory space, all of the file descriptors and other attributes. The threads are the units of execution within the process, they posess a register set, stack, program counter, and scheduling attributes - *per thread.*	CO1	BT1
16	What is the function of a process control block?. A (PCB) contains many pieces of information associated with a specific Process. It serves as the repository for any information that may vary From process to process.	CO1	BT1
17	What are the various process states? The various process states are a. New b. Ready c. Running d. Blocked e. Exit.	CO1	BT1
18	How does a process differ from a job? A process is an active entity with a program counter specifying the next instructions to execute and a set to associated resources, whereas a	CO1	BT1

	batchSystem executes jobs.(which is a collection of processes		
19	What are the main functions of the kernel? To provide mechanism for creation and deletion of processes inter process communication synchronization of processes.	CO1	BT1
20	Write the functions of an OS . (i) Memory Management. (ii) Processor management. (iii) Interrupt Handling. (iv) Accounting. (v) Automatic job sequencing. (vi) Management and control of I/O devices	CO1	BT1
	PART C (12 Marks)		
1	Explain the following i) The basic elements of a computer system ii)Processor register	CO1	BT2
2	Explain the essential properties of the following operating systems. a)Batch b)Interactive c)Time sharing d)Real Time e)Network f)parallel g)Distributed h)clustered	CO1	BT2
3	Explain the following i) OS control structures ii)Process control structures	CO1	BT2
4	i)Explain in detail the various reasons involved in process creation and termination. ii)Compare mode switching and process switching.	CO1	BT2
5	Explain in detail the single thread and multithread process model with diagrams	CO1	BT2
6	Compare user level and kernel level threads with necessary diagrams.	CO1	BT1
7	Explain how micro kernel architecture differs from layered kernel architecture.	CO1	BT2
8	With neat diagram explain the five states involved in process model.	CO1	BT1
9	Explain in detail i)how interrupts are processed. ii)how multiple interrupts are handled.	CO1	BT2
10	Explain the different I/O communication techniques	CO1	BT2

UNIT II

PROCESS SYNCHRONIZATION : Peterson's solution, Synchronization Hardware, Understanding the two-process solution and the benefits of the synchronization hardware, Process synchronization: Semaphores, usage, implementation, Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms, Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem, Good understanding of synchronization mechanisms, Classical Problems of synchronization – Dining Philosophers problem (Monitor), Understanding the synchronization of limited resources among multiple processes, CPU SCHEDULING : FCFS,SJF,Priority, Understanding the scheduling techniques, CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling, Understanding the scheduling techniques, Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling, Understanding the real time scheduling, DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods, Understanding the deadlock scenario, Deadlocks :Deadlock Avoidance, Detection and Recovery, Understanding the deadlock avoidance, detection and recovery mechanisms

PART B (4 Marks)

1	What is busy waiting?	CO2	BT2
2	Write short notes on turn around time, waiting time and response time	CO2	BT1
3	What is a binary semaphore?	CO2	BT1
4	What is the difference between synchronization and mutual exclusion?	CO2	BT2
5	List the Coffman's conditions that lead to a deadlock.	CO2	BT2
6	List the three requirements that must be satisfied by critical section problem.	CO2	BT1
7	Write short notes on semaphore	CO2	BT1
8	Illustrate about Petersons solution	CO2	BT2
9	Examine about mutex locks	CO2	BT1
10	Discuss about priority inversion with an example	CO2	BT2
11	Define CPU Scheduling.	CO2	BT1
12	What is Preemptive and Non - Preemptive scheduling?	CO2	BT1
13	What are the various scheduling criteria for CPU Scheduling?	CO2	BT1
14	Define Entry Section and Exit Section.	CO2	BT1
15	Give two hardware instructions and their definitions which can be used for implementing Mutual Exclusion.	CO2	BT2
16	How can we say the First Come First Served scheduling algorithm is Non Preemptive?	CO2	BT2
17	Differentiate Long Term Scheduler and Short Term Scheduler	CO2	BT1
18	What are a Safe State and an Unsafe State?	CO2	BT1
19	What is a Gantt Chart?	CO2	BT1

<table>
<tr><td>20</td><td>Define Request Edge and Assignment Edge.</td><td>CO2</td><td>BT1</td></tr>
<tr><td colspan="4">PART C (12 Marks)</td></tr>
<tr><td>1</td><td>Outline a solution using semaphores to solve dinning philosopher problem.</td><td>CO2</td><td>BT2</td></tr>
<tr><td>2</td><td>Compute non-preemptive SJF scheduling algorithm
<table>
<tr><th>Process</th><th>Arrival time</th><th>Burst time</th></tr>
<tr><td>P1</td><td>0</td><td>7</td></tr>
<tr><td>P2</td><td>2</td><td>4</td></tr>
<tr><td>P3</td><td>4</td><td>1</td></tr>
<tr><td>P4</td><td>5</td><td>4</td></tr>
<tr><td>P5</td><td>3</td><td>4</td></tr>
</table></td><td>CO2</td><td>BT3</td></tr>
<tr><td>3</td><td>Consider the following set of processes with the length of the CPU-burst time in given ms:
<table>
<tr><th>Process</th><th>Arrival time</th><th>Burst time</th></tr>
<tr><td>P1</td><td>8</td><td>0</td></tr>
<tr><td>P2</td><td>4</td><td>1</td></tr>
<tr><td>P3</td><td>9</td><td>2</td></tr>
<tr><td>P4</td><td>5</td><td>3</td></tr>
<tr><td>P5</td><td>3</td><td>4</td></tr>
</table>
Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, priority and RR (quantum=2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms.</td><td>CO2</td><td>BT3</td></tr>
<tr><td>4</td><td>Show how wait () and signal() semaphore operations could be implemented in multiprocessor environments, using Test and Set instructions. The solution should exhibit minimal busy waiting. Develop pseudo code for implementing operations.</td><td>CO2</td><td>BT2</td></tr>
<tr><td>5</td><td>Explain in detail about multilevel queue scheduling</td><td>CO2</td><td>BT1</td></tr>
<tr><td>6</td><td>Describe about multilevel feedback scheduling</td><td>CO2</td><td>BT1</td></tr>
<tr><td>7</td><td>With an example explain about resource allocation graph</td><td>CO2</td><td>BT1</td></tr>
<tr><td>8</td><td>Illustrate Bankers algorithm with an example</td><td>CO2</td><td>BT2</td></tr>
<tr><td>9</td><td>Describe Deadlock prevention in detail.</td><td>CO2</td><td>BT2</td></tr>
<tr><td>10</td><td>Explain the methods for handling deadlocks.</td><td>CO2</td><td>BT2</td></tr>
</table>

UNIT III			
MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping and understanding the basics of Memory management Contiguous Memory allocation – Fixed and Dynamic partition Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems Strategies for selecting free holes in Dynamic partition Understanding the allocation strategies with examples Paged memory management Understanding the Paging technique.PMT hardware mechanism Structure of Page Map Table Understanding the components of PMT Example : Intel 32 bit and 64 –bit Architectures Understanding the Paging in the Intel architectures Example : ARM Architectures Understanding the Paging with respect to ARM Segmented memory management Understanding the users view of memory with respect to the primary memory Paged segmentation Technique Understanding the combined scheme for efficient management			
PART B (4 Marks)			
1	How is memory protected in a paged environment?	CO3	BT1
2	What is External Fragmentation?	CO3	BT1
3	What is the use of Valid-Invalid Bits in Paging?	CO3	BT2
4	Explain memory management without swapping or paging	CO3	BT1
5	Explain page replacement algorithms	CO3	BT2
6	Why page sizes are always power of 2?	CO3	BT1
7	List two differences between logical and physical addresses.	CO3	BT4
8	Define demand paging in memory management.	CO3	BT1
9	What are the steps required to handle a page fault in demand paging?	CO3	BT1
10	Tell the significance of LDT and GDT in segmentation.	CO3	BT1
11	Explain dynamic loading.	CO3	BT2
12	What is Demand Paging?	CO3	BT1
13	How the problem of external fragmentation can be solved	CO3	BT1
14	Formulate how long a paged memory reference takes if memory reference takes 200 nanoseconds.Assume a paging system with page table stored in memory	CO3	BT6
15	Define Address binding.	CO3	BT1
16	What is Internal Fragmentation?	CO3	BT1
17	What do you mean by Compaction?	CO3	BT1
18	What is the difference between user-level instructions and privileged instructions?	CO3	BT1

19	What is memory stall?	CO3	BT1
20	Define logical address space	CO3	BT1
PART C (12 Marks)			
1	Elaborate about the free space management on I/O buffering and blocking.	CO3	BT6
2	Explain about given memory management techniques. (i) Partitioned allocation (ii) Paging and translation look-aside buffer.	CO3	BT5
3	When page faults will occur? Describe the actions taken by operating system during page fault.	CO3	BT1
4	Explain about the difference between internal fragmentation and external fragmentation	CO3	BT5
5	Why are segmentation and paging sometimes combined into one scheme?	CO3	BT1
6	Compare paging with segmentation in terms of the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses.	CO3	BT2
7	Most systems allow programs to allocate more memory to its address space during execution. Data allocated in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following schemes?	CO3	BT1
8	Explain the difference between logical address and physical address.	CO3	BT1
9	Define Compaction and explain why it is used.	CO3	BT1
10	Define Contiguous Allocation.	CO3	BT5

UNIT IV

VIRTUAL MEMORY– Background-Understanding the need of demand paging-VIRTUAL MEMORY – Basic concepts – page fault handling -Understanding , how an OS handles the page faults-Performance of Demand paging-Understanding the relationship of effective access time and the page fault rate-Copy-on write-Understanding the need for Copy-on write -Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques-Understanding the Pros and cons of the page replacement techniques-Counting based page replacement and Page Buffering Algorithms -To know on additional Techniques available for page replacement strategies-Allocation of Frames - Global Vs Local Allocation -Understanding the root cause of the Thrashing-Thrashing, Causes of Thrashing -Understanding the Thrashing -Working set Model-Understanding the working set model for controlling the Working set Model

PART B (4 Marks)

1	Define Swapping. what is its purpose?	CO4	BT 1
2	What is the basic method of Segmentation?	CO4	BT 1
3	Explain fragmentation and its types?	CO4	BT 1
4	What is the basic approach of Page Replacement?	CO4	BT 1
5	What is virtual memory? Mention its advantages	CO4	BT 2
6	Explain about contiguous memory allocation?	CO4	BT 1
7	Explain about advantages and disadvantages of paging?	CO4	BT 3
8	Differentiate local and global page replacement algorithm.	CO4	BT 2
9	Explain the need of copy-on-write ?	CO4	BT 2
10	Define dynamic loading.	CO4	BT 3
11	What is hit ratio and effective access time?	CO4	BT 2
12	Define page offset and page number	CO4	BT 2
13	Explain segment tables and its entries?	CO4	BT 3
14	What is compaction and need of compaction?	CO4	BT 2
15	What is page fault and page hit?	CO4	BT 2
16	What is a working set model?	CO4	BT 3
17	What are the essential content(s) in each entry of a page table?	CO4	BT 2
18	Define logical and physical address spaces?	CO4	BT 2
19	Draw the structure of page table	CO4	BT 2
20	Define: STBR and STLR	CO4	BT 1

PART C (12 Marks)

1	Explain how paging supports virtual memory. With neat diagram explain how logical address is translated into physical address	CO4	BT 2
2	Explain the basic concepts of segmentation in detail.	CO4	BT 2

3	Explain about the following page replacement algorithms a)FIFO b)OPR, c)LRU	CO4	BT 2
4	Describe Structure of Paging Table and its process?	CO4	BT 2
5	What is thrashing and explain the methods to avoid thrashing?	CO4	BT 2
6	Write about the techniques for structuring the page table?	CO4	BT 3
7	Explain about Logical & Physical Addressing?	CO4	BT 3
8	Describe Allocation of Frames mechanisms?	CO4	BT 3
9	Explain working set model in detail and how it is controlled?	CO4	BT1
10	Explain Counting based page replacement and Page Buffering Algorithms	CO4	BT 2

UNIT V

STORAGE MANAGEMENT: Mass storage structure – Overview of Mass storage – Magnetic Disks – Understanding the Basics in storage management – Disk Scheduling – Understanding the various scheduling with respect to the disk – FILE SYSTEM INTERFACE: File concept, File access methods – Understanding the file basics – File sharing and Protection – FILE SYSTEM IMPLEMENTATION: File system structure – Directory Implementation – Understanding the various levels of directory structure- Free space Management – Swap space Management

PART B (4 Marks)

1	Discuss the criteria for choosing a file organization?	CO5	BT1
2	List the common file types along with their extensions and describe each file type?	CO5	BT1
3	Differentiate among the following disk scheduling algorithms? a) FCFS b) SSTF	CO5	BT2
4	Explain the following in detail with respect to disk? a) Seek time b) Latency c) Access time d) Transfer time	CO5	BT1
5	Give an example of an application in which data in a file should be accessed in the following order: i. sequential ii. Random	CO5	BT2
6	Define the terms – file, file path, directory?	CO5	BT1
7	Explain any four common file attributes?	CO5	BT1
8	Explain any four file operations?	CO5	BT1
9	What are the advantages and disadvantages of contiguous and non-contiguous memory allocation?	CO5	BT2
10	Discuss in detail about various allocation methods	CO5	BT1
11	Prepare a general graph directory in file system	CO5	BT1
12	Express the views on –disk structure in file system implementation	CO5	BT2
13	Give the importance of swap space management	CO5	BT2

14	Conclude which disk scheduling algorithm would be the best to Optimize the performance of a RAM disk.	CO5	BT2
15	Summarize the characteristics that determine the disk access speed.	CO5	BT2
16	Discuss about a Disk space management	CO5	BT1
17	Discuss about Swap -space management	CO5	BT1
18	Define log structured file. What are the disadvantages of log Structured file systems?	CO5	BT2
19	Discuss the advantage and disadvantages of supporting links to files that cross mount points	CO5	BT2
20	Discuss the objectives of file management system.	CO5	BT2
PART C (12 Marks)			
1	Describe indexed file and indexed sequential file organization?	CO5	BT1
2	Describe the file system of UNIX?	CO5	BT1
3	Differentiate among the following disk scheduling algorithms? a) SCAN b) C-SCAN c) LOOK d) C-LOOK	CO5	BT2
4	Explain the following file concepts: a) File attributes b) File operations c) File types d) Internal file structure	CO5	BT1
5	Discuss the following a) File system mounting b) Thrashing	CO5	BT1
6	Explain the concept of file sharing? What are the criteria to be followed in systems which implement file sharing?	CO5	BT1
7	Describe the following Directory Implementation methods? a) Linear List b) Hash Table	CO5	BT1
8	Explain the concept and techniques of free space management?	CO5	BT1
9	Discuss in detail the performance issues of secondary storage management?	CO5	BT2
10	Consider that a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms? A. FCFS B. SSTF C. SCAN D. C-SCAN E. LOOK F. C-LOOK	CO5	BT5

Note:

1. **BT Level –** Blooms Taxonomy Level

2. CO – Course Outcomes

BTL1 –Remember BTL2 – Understand BTL3 – Apply BTL4 – Analyze BTL5 – Evaluate BTL6 – Create