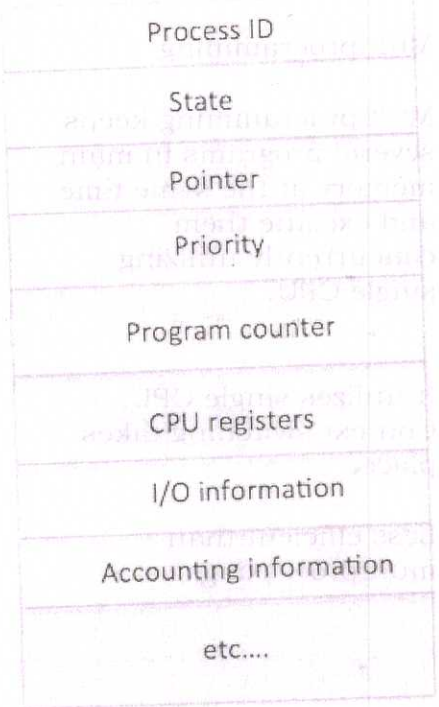
Code (15)4134

OPERATING SYSTEMS

SCORING INDICATORS

QNo	Key			Split score	Total score
1	A loader is a system program, which takes the object code of a program as input and prepares it for execution. Following are the function i. Allocation ii. Linking iii. Relocation iv. Loading			½ +½+½+ ½	2
2	An operating system is the primary software that manages all the hardware and other software on a computer. Windows,DOS,Unix,Linux (Any one)			1 1	2
3	Cooperating processes are those that can affect or are affected by other processes running on the system,including sharing data.			2	2
4	A page fault occurs when a program attempts to access a block of memory that is not stored in the physical memory, or RAM			2	2
5	A VirtualBox or VB is a software virtualization package that installs on an operating system as an application. VirtualBox allows additional operating systems to be installed on it			2	2
II.1	Sr. No.	Multiprocessing	Multiprogramming	1½ Marks each	6
	1	Multiprocessing refers to processing of multiple processes at same time by multiple CPUs.	Multiprogramming keeps several programs in main memory at the same time and execute them concurrently utilizing single CPU.		
	2 3	It utilizes multiple CPUs.	It utilizes single CPU. Context switching takes		
	4	It permits parallel processing. It facilitates much efficient utilization of devices of the computer system.	place. Less efficient than multiprocessing.		

2	Operating system act as interface between user and hardware. The main functions are: 1. Memory Management –The operating system manages the Primary Memory or Main Memory. 2. .Processor Management –In a multi programming environment, the OS decides the order in which processes have access to the processor, and how much processing time each process has. This funcDevice Management – 3. An OS manages device communication via their respective drivers. It performs the following activities for device management. Keeps tracks of all devices connected to system. tion of OS is called process scheduling. 4. File Management –A file system is organized into directories for efficient or easy navigation and usage. These directories may contain other directories and other files.			1½ Marks each	6
3	A Process Control Block is a data structure maintained by the Operating System for every process.  Diagram+definition				6

<table>
<tr><td></td><td>Explanation of fields</td><td>2 marks
4 marks</td><td></td></tr>
<tr><td>4</td><td>Deadlock can arise if following four conditions hold simultaneously

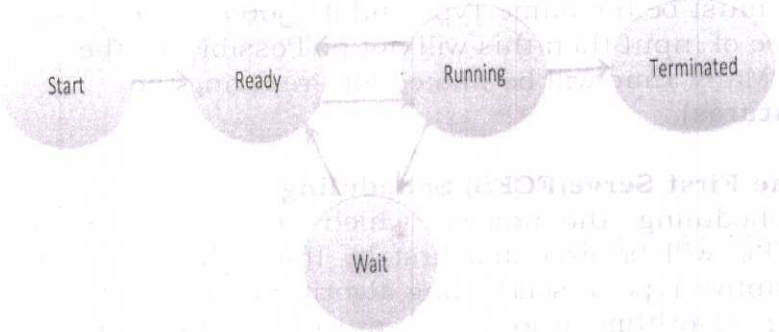
1.Mutual Exclusion: One or more than one resource are non-sharable (Only one process can use at a time)
2.Hold and Wait: A process is holding at least one resource and waiting for resources.
3.No Preemption: A resource cannot be taken from a process unless the process releases the resource.
4.Circular Wait: A set of processes are waiting for each other in circular form.</td><td>1½ Marks each</td><td>6</td></tr>
<tr><td>5</td><td>The fundamental difference between logical and physical address is that logical address is generated by CPU during a program execution whereas, the physical address refers to a location in the memory unit.

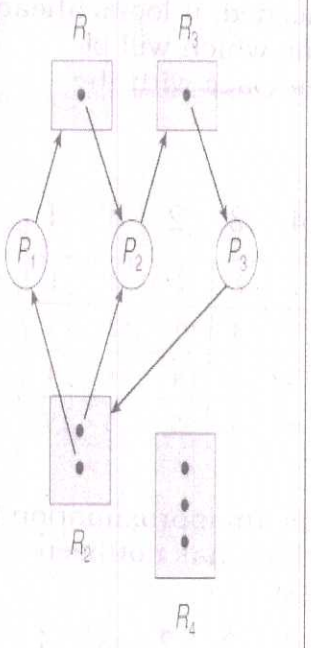
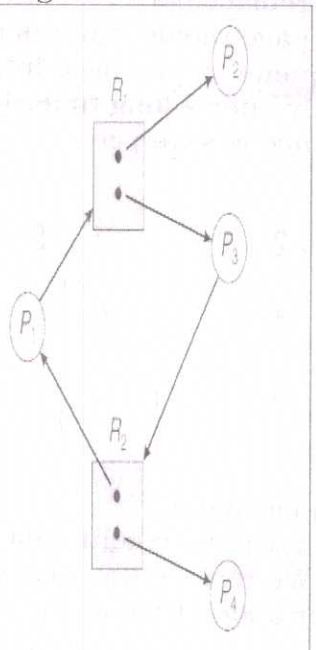
<table><tr><td>Logical address</td><td>physical address</td></tr><tr><td>It is the virtual address generated by CPU</td><td>The physical address is a location in a memory unit.</td></tr><tr><td>Set of all logical addresses generated by CPU in reference to a program is referred as Logical Address Space.</td><td>Set of all physical addresses mapped to the corresponding logical addresses is referred as Physical Address.</td></tr><tr><td>The user can view the logical address of a program.</td><td>The user can never view physical address of program</td></tr></table></td><td>1½ Marks each</td><td>6</td></tr>
<tr><td>6</td><td>Files are used to store the required information for its later uses

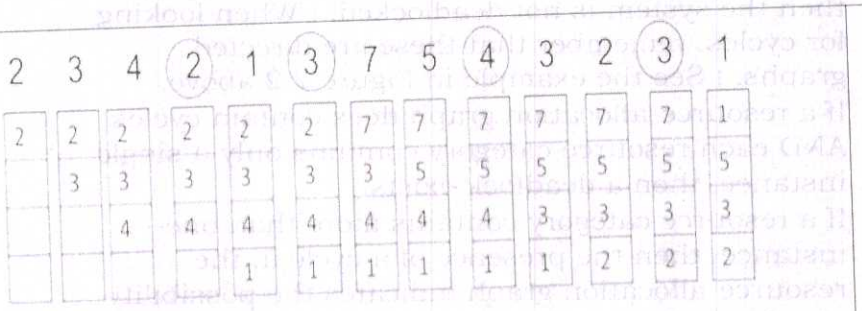
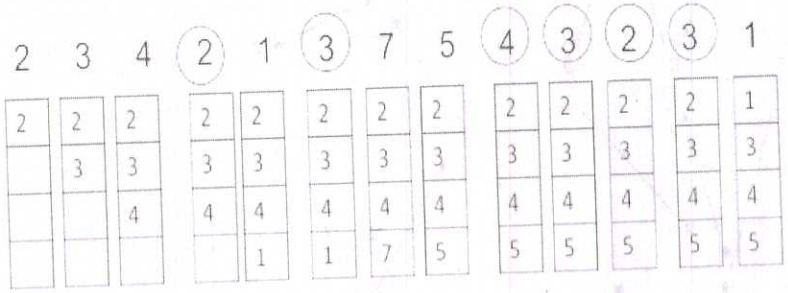
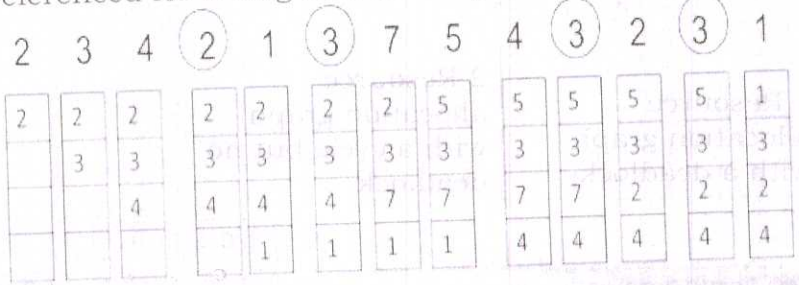
• File Create operation
• File Delete operation
• File Open operation
• File Close operation
• File Read operation
• File Write operation
• File Append operation
• File Seek operation</td><td>3+3</td><td>6</td></tr>
</table>

	• File Rename operation		
7	Virtualization means to create a virtual version of a device or resource, such as a server, storage device, network or even an operating system where the framework divides the resource into one or more execution environments. Definition Mention types	3 marks 3 marks	6
III a.	**Assembler** is a program that converts assembly level language (low level language) into machine level language. **Compiler** compiles entire source code into machine code. Whereas, **Interpreters** converts source code into intermediate code and then this intermediate code is executed line by line.	3 marks each	9
III b	There is also a Operating System which is known as Real Time Processing System. In this Response Time is already fixed. Means time to Display the Results after Possessing has fixed by the Processor or CPU.	2 marks	

	Types A hard real time system guarantees that critical tasks complete on time. A Soft real time systems where a critical real-time task gets priority over other tasks and retains that priority until it completes	4 marks	
IV .a	Explanation for multitasking Windows is single user multitasking operating systems Unix is multi user multitasking operating systems 4 comparison	1 mark 2 marks each	9
IV.b	The Batch Processing is same as the Serial Processing Technique. But in the Batch Processing Similar Types of jobs are Firstly Prepared and they are Stored on the Card. and that card will be Submit to the System for the Processing. **(Definition)** The System then Perform all the Operations on the Instructions one by one. And a user can't be Able to specify any input. And Operating System wills increments his Program Counter for Executing the Next Instruction. The Main Problem is that the Jobs those are prepared for Execution must be the Same Type and if a job requires for any type of Input then this will not be Possible for the user. And Many Time will be wasted for Preparing the Batch**(Features)**	2 marks 4 marks	6
V.a	**First Come First Serve(FCFS) Scheduling** In this scheduling, the process which arrives first in front of CPU will be executed first by the CPU. It is a non-preemptive type of scheduling algorithm, i.e. in this scheduling algorithm priority of processes does not matter, or you can say that whatever the priority of the process is, the process will be executed in the manner they arrived in front of the CPU. **Round Robin scheduling algorithm**	41/2 marks each	

	Round robin scheduling is the preemptive scheduling algorithm. In this scheduling, every process gets executed cyclically or you can say that a particular time slice is allocated to each process to which we can say as time quantum. Every process, which wants to execute itself, is present in the queue. CPU is assigned to the process for that time quantum. Now, if the process completed its execution in that quantum of time, then the process will get terminated, and if the process does not achieve its implementation, then the process will again be added to the ready queue, and the previous process will wait for its turn to complete its execution.		9
V.b	In this scheduling algorithm, the process which has the shortest burst time will be processed first by the CPU. In this, the arrival time of all the processes must be the same. Also, the processor must have to aware about the burst time of all the processes in advance. Average waiting time =6.3	2 marks 4 marks	6
VI.a	A process is basically a program in execution. The execution of a process must progress in a sequential fashion.When a process executes, it passes through different states. These stages may differ in different operating systems(Definition)  Diagram State explanation	2 marks 2 marks 1 marks	9
VI. b	The resource allocation graph is the pictorial representation of the state of a system. As its name suggests, the resource allocation graph is the complete information about all the processes which are holding some resources or waiting for some resources.		8

	Detection • If a resource-allocation graph contains no cycles, then the system is not deadlocked. (When looking for cycles, remember that these are directed graphs.) See the example in Figure 7.2 above. • If a resource-allocation graph does contain cycles AND each resource category contains only a single instance, then a deadlock exists. • If a resource category contains more than one instance, then the presence of a cycle in the resource-allocation graph indicates the possibility of a deadlock, but does not guarantee one. Consider, for example, Figures 1 and 2 below:  1.Resource allocation graph with a deadlock  2.Resource allocation graph with a cycle but no deadlock		
VII .a	FIFO page replacement: In FIFO page replacement, when a page is needed to be replaced, we select the oldest page.	3 marks each	

	 Optimal Page replacement: Here, when a page replacement is needed, it looks ahead in the input queue for the page frame which will be referenced only after a long time. The page with the longest reference is swapped.  LRU page replacement: This method uses the recent past as an approximation of near future. We replace the page which has not been referenced for a long time in the past. 		
VII.b	As processes are loaded and removed from memory, the free memory space is broken into little pieces. It happens after sometimes that processes cannot be allocated to memory blocks considering their small size and memory blocks remains unused. This problem is known as Fragmentation. Fragmentation is of two types 1.External fragmentation Total memory space is enough to satisfy a request or to	2 marks 2 marks each	6

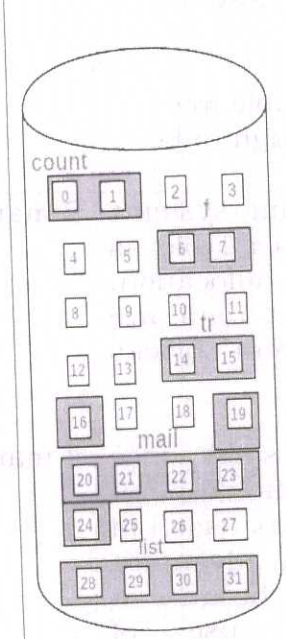
	reside a process in it, but it is not contiguous, so it cannot be used. 2.Internal fragmentation Memory block assigned to process is bigger. Some portion of memory is left unused, as it cannot be used by another process.		
VIII. a	**First Fit** In the first fit approach is to allocate the first free partition or hole large enough which can accommodate the process. It finishes after finding the first suitable free partition. **Best Fit** The best fit deals with allocating the smallest free partition which meets the requirement of the requesting process. This algorithm first searches the entire list of free partitions and considers the smallest hole that is adequate. It then tries to find a hole which is close to actual process size needed. **Worst fit** In worst fit approach is to locate largest available free portion so that the portion left will be big enough to be useful. It is the reverse of best fit.	3 marks each	9
VIII. b	A technique used by virtual memory operating systems to help ensure that the data you need is available as quickly as possible.Paging refers to memory allocation. In a paging memory management scheme, data are stored and managed in identical consistent blocks referred to as 'pages.(Definition) The physical region of memory containing a single page is called a frame. When paging is used, a frame does not have to comprise a single physically contiguous region in secondary storage. This approach offers an advantage over earlier memory management methods, because it facilitates more efficient and faster use of storage.(advantages)	2 marks 4 marks	6
IX a	The allocation methods define how the files are stored in the disk blocks. There are three main disk space or file allocation methods. Contiguous Allocation Linked Allocation Indexed Allocation **1. Contiguous Allocation**	1 mark	9

In this scheme, each file occupies a contiguous set of blocks on the disk. For example, if a file requires n blocks and is given a block b as the starting location, then the blocks assigned to the file will be: b, b+1, b+2,.....b+n-1.The directory entry for a file with contiguous allocation contains

Address of starting block
Length of the allocated portion.

Below example the file 'mail' in the following figure starts from the block 19 with length = 6 blocks. Therefore, it occupies 19, 20, 21, 22, 23, 24 blocks.

4 marks each



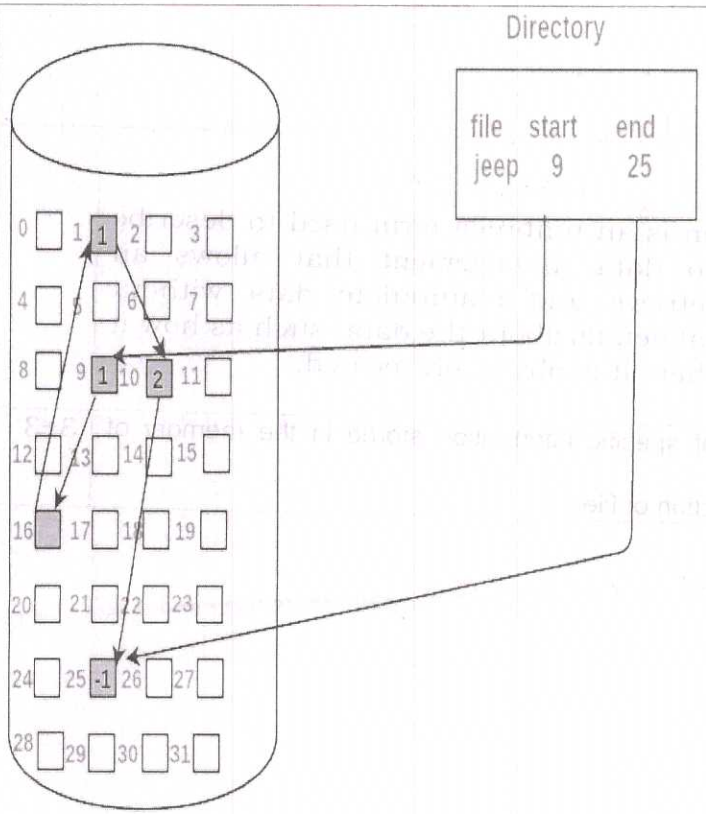
Directory

file	start	length
count	0	2
tr	14	3
mail	19	6
list	28	4
f	6	2

2. Linked List Allocation

In this scheme, each file is a linked list of disk blocks which need not be contiguous. The disk blocks can be scattered anywhere on the disk.
The directory entry contains a pointer to the starting and the ending file block. Each block contains a pointer to the next block occupied by the file.

Below example the file 'jeep' in following image shows how the blocks are randomly distributed.

			
IX.b	A thin client is a stateless, fanless desktop terminal that has no hard drive. All features typically found on the desktop PC, including applications, sensitive data, memory, etc., are stored back in the data center when using a thin client.(Definition) In general, thin clients are centrally managed, are not as vulnerable to malware attacks, have a longer life cycle, use less power and are less expensive to purchase. Since the idea is to limit the capabilities of thin clients to only essential applications(Advantages& Disadvantages)	2 marks 4 marks	6
X.a	Storage virtualization is the pooling of physical storage from multiple storage devices into what appears to be a single storage device -- or pool of available storage capacity -- that is managed from a central console. The technology relies on software to identify available storage capacity from physical devices and to then aggregate that capacity as a pool of storage that can be used in a virtual environment by virtual machines (VMs). Memory virtualization Physical memory across different servers is aggregated into a single virtualized memory pool. It provides the benefit of an enlarged contiguous	3 marks each	9

	working memory. Data virtualization is an umbrella term used to describe any approach to data management that allows an application to retrieve and manipulate data without requiring technical details about the data, such as how it is formatted or where it is physically located.		
X.b	A **file** is collection of specific information stored in the memory of computer **system.** **Directory** is a collection of files	3+3	6

QUESTION WISE ANALYSIS

Course: OPERATING SYSTEMS **CODE: TED (15)4134**

Qn. No.	Specific outcome	Module	Content Detail	Score	Time in Minutes
I 1	1.1.3	I	Discuss loader and its functions	2	2
I 2	2.3.1	II	Discuss co-operating processes	2	2
I 3	3.2.3	III	Explain page-faults and how to handle page faults.	2	2
I 4	3.1.7	III	Discuss segmentation, and the advantages of segmentation over paging	2	2
I 5	4.2.4	IV	Explain virtual Box	2	2
II 1	1.2.4, 1.2.6	I	Discuss multiprogramming systems Describe multiprocessor systems	6	10
II 2	1.2.2	I	List the functions of Operating Systems	6	10
II 3	2.1.2	II	Desribe process control block (PCB) and its general structure.	6	10
II 4	2.3.6	II	Explain deadlock and its causes	6	10
II 5	3.1.2	III	Differentiate the logical address and physical address.	6	10
II 6	4.1.2	IV	Discuss the various file operations	6	10
II 7	4.2.1, 4.2.2	IV	Discuss the concept of virtualization Discuss different types of virtualization	6	10
III a	1.1.2	I	Discuss assembler and its functions 1.1.4 Discuss compilers and interpreters and their functions	9	18
III b	1.2.7	I	Describe real time systems	6	12
IV a	1.2.8	I	Discuss Unix, Windows, and Linux operating systems	9	18
IV b	1.2.3	I	Discuss batch systems	6	12
V a	2.2.7	II	Explain FCFS, SJF, Priority, and RR scheduling algorithms and their Gantt charts	9	18
V b	2.2.7	II	Explain FCFS, SJF, Priority, and RR scheduling algorithms and their Gantt charts	6	12
VI a	2.1.3	II	Explain the different states of a process with the help of state diagram.	9	18
VI b	2.3.5	II	Explain resource allocation graphs	6	12
VII a	3.2.4	III	Discuss page replacement algorithms: FIFO, optimal, LRU,	9	18
VII b	3.1.5	III	Define fragmentation – internal and external, and suggest solutions	6	12
VIII a	3.1.4	III	Explain first fit, best fit and worst fit allocation strategies	9	18
VIII b	3.1.6	III	Explain paging and paging hardware	6	12
IX a	4.1.5	IV	Explain about different allocation methods – contiguous, linked and indexed allocations	9	18
IX b	4.2.5	IV	Explain about thin client	6	12
X a	4.2.2	IV	Discuss different types of virtualization	9	18
X b	4.1.1	IV	Discuss the concept of file and directory	6	12

Signature:

Name:

Designation:

Institution: