Modified

CBCS SCHEME

USN | | | | | | | | | |

18EC641

Sixth Semester B.E. Degree Examination, July/August 2022
Operating System

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define operating system. Explain the goals of an operating system. **(10 Marks)**

b. What are Computational structures? Explain the operation of an operating system. **(10 Marks)**

OR

2 a. Explain:

i) Partition based

ii) Pool based resource allocation strategies with a neat diagram. **(10 Marks)**

b. Briefly explain the different classes of operating system, specifying the primary concern and key concepts used. **(10 Marks)**

Module-2

3 a. Explain the fundamental state transition for a process with state transition diagram. **(10 Marks)**

b. For the following set of process perform FCFS and SRN scheduling. Calculate mean turn around time and mean weighted turn around.

Process	P_1	P_2	P_3	P_4	P_5
Arrival time	0	2	3	5	9
Service time	3	3	2	5	3

(10 Marks)

OR

4 a. Define threads. Explain: i) User – level threads ii) Kernel level threads. **(10 Marks)**

b. For the following set of process perform RR and LCN scheduling. **(10 Marks)**

Process	P_1	P_2	P_3	P_4	P_5
Arrival time	0	2	3	5	9
Service time	3	3	2	5	3

Module-3

5 a. Explain contiguous and non contiguous memory allocation. **(10 Marks)**

b. Explain: i) Paging ii) Segmentation. **(10 Marks)**

OR

6 a. Explain the important concepts in the operation of demand paging with diagram. **(10 Marks)**

b. For the following page reference string apply FIFO and LRU page replacement policies to find number of page faults. Use alloc = 4.

Page reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

Reference time string: $t_1, t_2, t_3, t_4, t_5, t_6, t_7, t_8, t_9, t_{10}, t_{11}, t_{12}, t_{13}$.

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

7 a. Explain the different file operations performed by processes. (10 Marks)
b. Explain the interface between file system and IOCS. (10 Marks)

OR

8 a. Explain the working of linked allocation of disk space with a figure. (10 Marks)
b. Explain implementing file access with neat figure. (10 Marks)

Module-5

9 a. Explain the primary issues in implementing message passing. (10 Marks)
b. Explain the working of blocking and non-blocking delivery protocols. (10 Marks)

OR

10 a. Define dead lock. Explain the condition of dead lock in resource allocation. (10 Marks)
b. Explain the three fundamental approaches used in dead lock handling. (10 Marks)

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18EC641

Sir, regarding Modification of Scheme and Solutions of ECE/ETE board

"Manjunatha P" <manjup.jnnce@gmail.com>

To: boe@vtu.ac.in

August 23, 2022 10:36 AM

Dear sir,

I am herewith sending the details of Comments from BoE of ECE Board for the following subjects towards Scheme and solution. Kindly download the attachment.

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"APPROVED"

RE

Registrar (Evaluation)
Visvesvaraya Technological University
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Subject: Operating Systems Code: 18EC641 The following are the corrections required.

Q 9a. The answer for Q 9a is

Issues in message passing

Issue	Important aspects
Naming of processes	Processes participating in a message transfer are either explicitly indicated in `send` and `receive` statements, or they are deduced by the kernel in some other manner.
Method for transferring messages	Whether a sender process is blocked until the message sent by it is delivered, the order in which messages are delivered to the receiver process, and handling of exceptional conditions in message passing.
Kernel responsibilities	Buffering of messages pending delivery to recipient processes. Blocking and activation of processes.

generality of message passing. For example, requiring a sender process to know the identity of a receiver process may limit the scope of message passing to processes in the same application program. Relaxing this requirement would extend message passing to processes of different application programs and even to processes executing in different computer systems. Similarly, providing FIFO message delivery may be rather restrictive; processes may wish to receive messages in some order of their own choice.

System calls *send* and *receive* act as communication primitives. The number and meaning of their parameters are determined by the issues described in Table 10.1. We discuss various aspects of these primitives in the following Sections.

Q 6b For LRU policy - Number of page faults should be 8.

Other than this, as per the scrutiny from BoE members, there are no correction
Hence the same may be considered for the further process

Dr. Manjunatha. P
Chairman BoE for ECE
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Signature of Scrutinizer

Scheme & Solutions

Subject Title : Operating System.   Subject Code : 18EC641

Question Number	Solution	Marks Allocated
1a	An operating system is system software that manages computer hardware, software resources, and provides common services for computer program. It is a software that controls the operation of a computer and directs the processing of program Goal of operating system The key goal of an operating system is to provide a combination of efficient use and user convenience Efficient use: Efficient use of resources can be obtained by monitoring the use of resources and performing corrective actions when necessary. However, a computer system contains several resources like memory, I/o devices and the cpu. So a comprehensive method of monitoring efficiency may lead to high overhead. Consequently, operating system employ simple and easy to apply but known-to-be-suboptimal strategies for ensuring good efficiency, e.g they either focus on efficiency of a few important resources like the cpu and memory, or handle user programs in a manner that guarantees high efficiency.	(3) (7m)

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Subject Title: Operating System **Subject Code:** 18EC641

Question Number	Solution	Marks Allocated
	User Convenience: User convenience has several facets	
	Facet — **Examples**	
	(1) Necessity — Ability to execute programs, use the file system.	
	(2) Good service — Speedy response to computational requests	
	(3) User friendly OS — Easy-to-use commands, Graphical User interface (GUI)	(3+7 =10m)
	(4) New programming model — Concurrent programming	
	(5) Features for experts — Means to set up complex computational structures	
	(6) Web-Oriented Services — Means to set up Web-enabled servers.	
1b	Computational structures: A computational structure is a configuration of one or more programs that work towards a common goal. Some typical computational structures are * A single program * Co-executing programs * A sequence of single programs.	(2m)
	Operation of an OS An operating system implements computational requirements of its users with the help of resources of the computer system. Key concerns of an operating system (1) Programs: Initiation and termination of programs. Providing convenient methods so that several programs can work towards a common goal. Resources: Ensuring availability of resources in the system and allocating them to programs. Scheduling: Deciding when, and for how long, to	(8m)

Subject Title : Operating system   Subject Code : 18EC641

Question Number	Solution	Marks Allocated
	devote the cpu, to a program. Protection: protect data, and programs against interference from other users and their programs. Common tasks performed by operating systems. 1. Maintain a list of authorized users. 2. Construct a list of all resources in the system. 3. Initiate execution of programs. 4. Maintain resource usage information by programs and current status of all programs. 5. Maintain current status of all resources and allocate resources to programs when requested. 6. Perform scheduling. 7. Maintain information for protection. 8. Handle requests made by users and their programs.	(2+8) =(10m)
2a	Partition based: The os decides a priori what resources should be allocated to a user program. This approach is called static Allocation because the allocation is made before the execution of a program begins. Pool Based: The OS maintains a common pool of resources and allocates from this pool whenever a program requests a resource. This approach is called dynamic Allocation because allocation takes place during execution of a program.	(5m) (5m) (5+5) =10m
2b	OS class / Period / Prime Concern / Key Concepts Batch processing / 1960's / cpu idle time / Spooling, Command Processor Multi programming / 1970's / Resource utilization / Program priorities, Preemption Time sharing / 1970s / Good response time / Time slice, round-robin Scheduling Real time / 1980s / Meet the deadline / Real time Scheduling Distributed / 1990's / Resource sharing / Transparency, distributed Control	Each (2m) 5×2 =(10m)

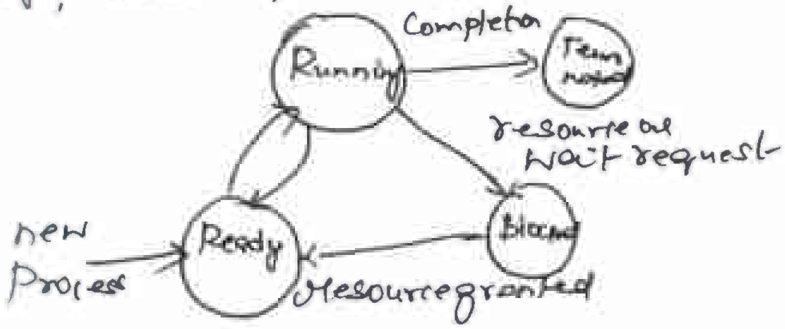
Subject Title : Operating System   Subject Code : 18EC641

Question Number	Solution	Marks Allocated

3a The Process State is an indication of the nature of the Current activity in a process

Running, Blocked, Ready, Terminated

Expl - 7m; Diagram - 3m; (7+3 = 10m)



3b

Process	P_1	P_2	P_3	P_4	P_5
Arrival time	0	2	3	5	9
Service time	3	3	2	5	3

5×2 (=10m)

FCFS

Turn around time t_a = Completion time - Arrival time

Turn Around time P_1 = 3 - 0 = 3 sec

Turn Around time P_2 = 6 - 2 = 4 sec

Turn Around time P_3 = 8 - 3 = 5 sec

Turn Around time P_4 = 13 - 5 = 8 sec

Turn Around time P_5 = 16 - 9 = 7 sec

Average turn Around time = $\frac{3+4+5+8+7}{5} = \frac{27}{5}$ = 5.40 sec.

Weighted turn Around time (W) = $\frac{\text{Turn Around time}}{\text{Service time}}$

W.T.A for P_1 = 3/3 = 1;

W.T.A for P_2 = 4/3 = 1.33;

W.T.A for P_3 = 5/2 = 2.50;

W.T.A for P_4 = 8/5 = 1.60

W.T.A for P_5 = 7/3 = 2.33.

Average Weighted turn around time = $\frac{1+1.33+2.50+1.60+2.33}{5}$

= 1.75

Subject Title : Operating system   Subject Code : 18EC641

Question Number	Solution	Marks Allocated

Shortest request next

P1	P3	P2	P4	P5

0 3 5 8 13 16

3 2 3 5 3

(5+5) (10m)

Turn Around time = Completion time - Arrival time

$P_1 \rightarrow t_a = 3-0 = 3sec$

$P_3 \rightarrow t_a = 5-3 = 2sec$

$P_2 \rightarrow t_a = 8-2 = 6sec$

$P_4 \rightarrow t_a = 13-5 = 8sec$

$P_5 \rightarrow t_a = 16-9 = 7sec$

Average turn Around time $= \frac{3+2+6+8+7}{5} = \frac{26}{5} = 5.20sec$

Weighted Average turn Around time (W) =

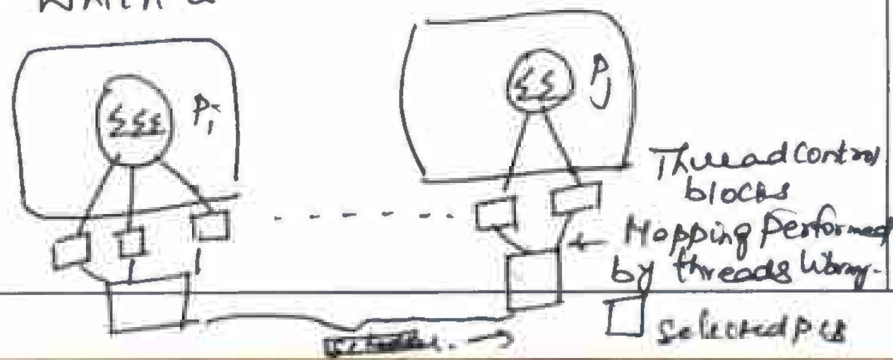
$P_1 = 3/3 = 1$; $P_3 = 2/2 = 1$; $P_2 = 6/3 = 2$;

$P_4 = 8/5 = 1.60$; $P_5 = 7/3 = 2.33$

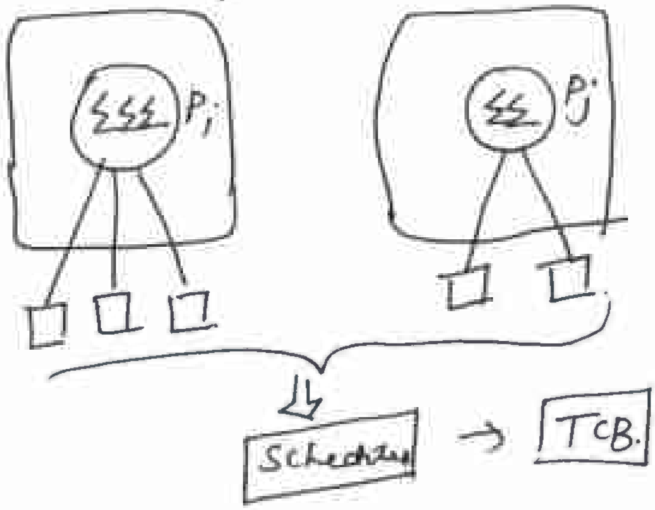
Average weighted turn Around time $= \frac{1+1+2+1+1.60+2.3}{5} = 1.59$

4a Threads: A thread is a program execution that uses the resources of a process. (2m)

User level Thread: Are implemented by a thread library which is linked to the code of a process (4m)



Question Number	Solution	Marks Allocated
	Kernel-Level Threads: A kernel level thread is implemented by kernel.	(4m) (2+4+4) =(10m)



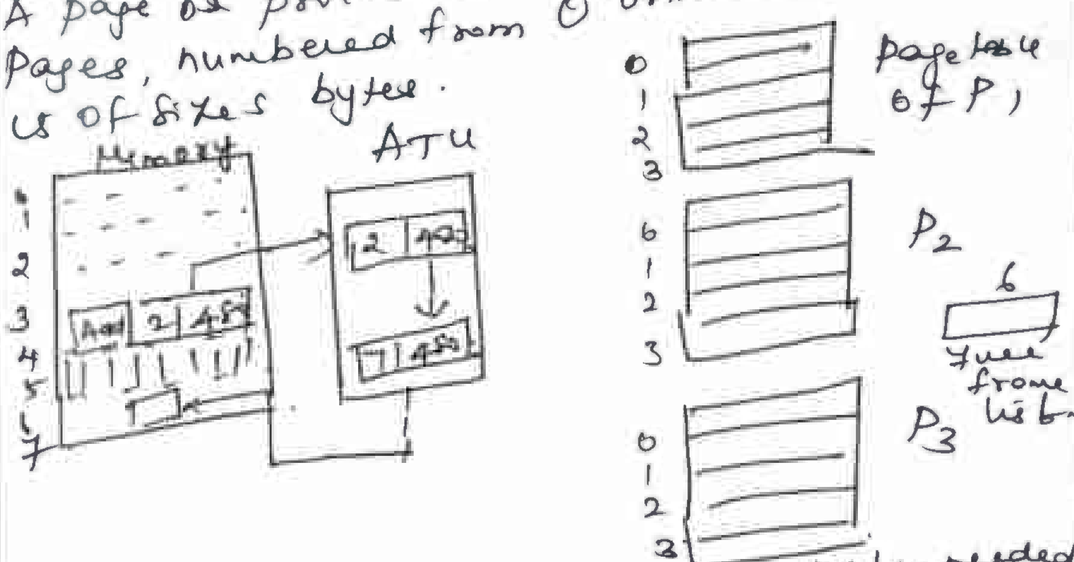
4b Round Robin Scheduling (5m)

P	AT	BT	W	C.T	TA BT-AT
P1	0	3	4/3=1.333	4	4-0=4
P2	2	3	7/3=2.33	9	9-2=7
P3	3	2	5/2=2.50	8	8-3=5
P4	5	5	11/5=2.20	16	16-5=11
P5	9	3	6/3=2	15	15-9=6

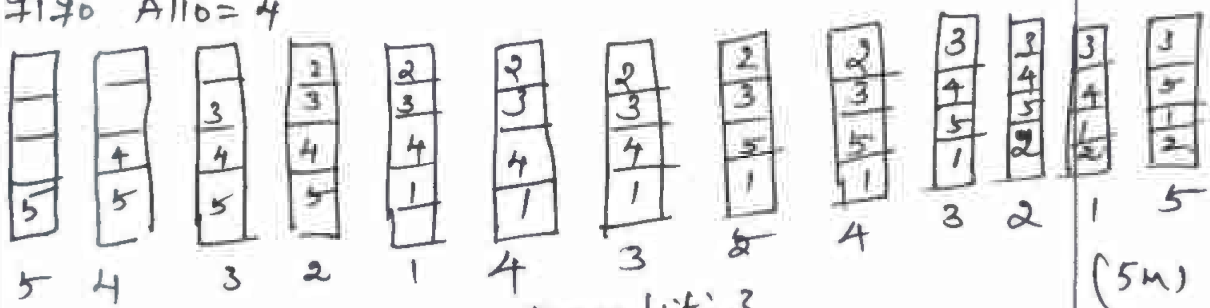
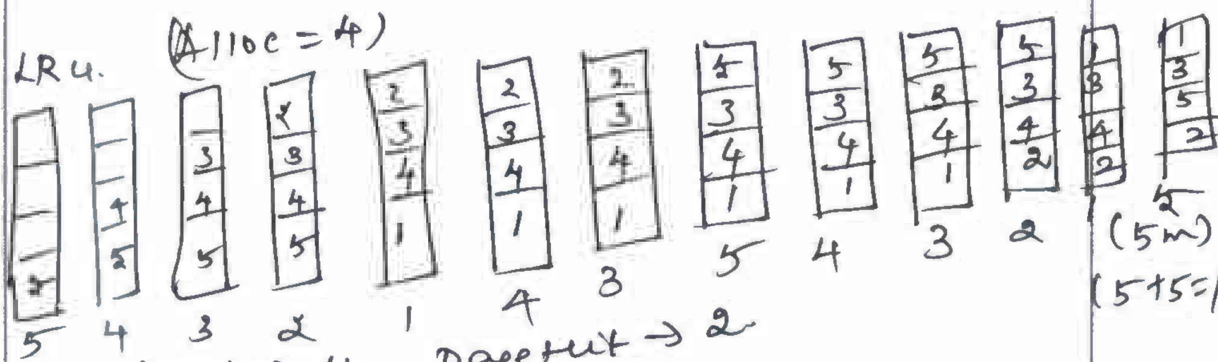
LCN Scheduling (5m)

P	c	ta	waiting time	Weighted turn Around time
P1	9	0-9=9	9-3=6	9/3=3
P2	12	12-2=10	10-3=7	10/3=3.33
P3	7	7-3=4	4-2=2	4/2=2
P4	16	16-5=11	11-5=6	11/5=2.20
P5	14	14-9=5	5-3=2	5/3=1.67

Subject Title : Operating System Subject Code : 18EC641

Question Number	Solution	Marks Allocated
5a	Contiguous Memory Allocation : Each process is allocated a single contiguous area in memory. In early computer systems the memory allocation decision was made statically i.e before the execution of a process began. Write the memory structure Non-Contiguous Memory Allocation : Several non-adjacent memory areas are allocated to a process. None of these areas is large enough to hold the complete process. Write the memory allocation structure.	(5+5) = 10m.
5b	Paging : In paging each process consist of fixed size components called pages. Segmentation: A programmer identifies components called segments in a process. A segment is a logical entity in a program. eg a function, a data structures or an object.	(5+5) (10m)
6a	Demand paging: A page of process is viewed to consist of pages, numbered from 0 onwards. Each page is of size s bytes.  A page is loaded in memory when needed, i.e when a logical address generated by a process points to a page that is not present in memory.	Expl - 8 Dia - 2 (8+2) (10m)

Subject Title : Operating System Subject Code : 18EC(64)

Question Number	Solution	Marks Allocated
6b	FIFO & LRU Page replacement powers.	
	FIFO Allo = 4	
		(5m)
	Pagefault ; 10 , page hit: 3	
	LRU. (Alloc = 4)	
		(5m) (5+5=10m)
	Pagefault → 11, pagehit → 2	
	Module - 4	
7a	(1) opening a file (2) Reading or writing (3) closing (4) file creation (5) file deletion (6) file renaming	2 marks Each (5×2=10m)
	Explanation is required	
7b	Interface between file system & IOCS. Interface between & uses IOCS Mechanism to implement I/O operation. These mechanism uses I/O programming to handle I/O initiation & interrupt device level details of I/O handling	Expl - 8 Dia - 2 (8+2) 10m
	Diagram — 2	
	Expl → 8	
8a	Linked Allocation of disk space. A file is represented by a linked list of disk blocks	(8+2) 10m
	Diagram 2	
	Expl — 8	

Subject Title : Operating System Subject Code : 18EC641

Question Number	Solution	Marks Allocated
8b	Implementing File Access: Use of directory structure and file control block (FCB) in implementing a file access. The scheme discussed there uses an FCB to keep track of current state of a file processing activity. Diagram → 2 Expl → 8	(8+2) 10m.
9a	Implementing Message passing: When a process Pi sends a message to some process Pj using nonblocking send, the kernel builds an inter process message control block (IMCB) to store all information. Diagram → 2 Expl — 8	(8+2) 10m
9b	Blocking and Non blocking delivery Protocols Diagram → 3 Expl — 7	(7+3)
10a	Deadlock: A set of processes is deadlocked if each of them waits for an event that can be caused only by process in the set → 3m. Resource Allocation Conditions of deadlock claim Expl + Diagram → (5m + 2m)	3+7 =10m
10b.	Fundamental Approaches used in Deadlock Handling. Three fundamental Approaches used: (1) Deadlock detection & Resolution. Deadlock Prevention. Deadlock Avoidance.	(10m)