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Table of Contents

Note : Remove "Table of Content" before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

17EC553 : OPERATING SYSTEM

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	EC
Year / Semester :	3/5	Academic Year:	2019-20
Course Title:	OPERATING SYSTEM	Course Code:	15EC553
Credit / L-T-P:	40-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	55	SEE Marks:	100 Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	SHILPA RANI P	Sign	Dt:
Checked By:		Sign	Dt:

2. Course Content

Module	Module Content	Teaching Hours	Module Concepts	Blooms Level
1	OS, Goals of an OS, Operation of OS, Computational structures, Resource allocation techniques, Efficiency, System Performance and User Convenience, Classes of Operating System, Batch processing, Multi-programming, Time sharing systems, Real time and distributed Operating System.	10	Operation of OS, Classes of OS	L2, L2
2	OS view of Processes, PCB, Fundamental state transitions, Threads, Kernel and User level Threads, Non-Preemptive scheduling-FCFS and SRN, Preemptive Scheduling-RR and LCN, Long term, medium term and short term scheduling in a time sharing system.	11	Threads in process, Process scheduling	L2,L3
3	Contiguous memory allocation, Non-contiguous memory allocation, Paging, Segmentation, Segmentation with paging, Virtual Memory Management, Demand paging,	11	Memory allocation, Virtual	L3, L3

	Paging hardware, VM handler, FIFO, LRU page replacement policies		memory	
4	File system and IOCS, File Operations, File Organizations, Directory Structures, File Protection, Interface between File system and IOCS, Allocation of disk space, Implementing file access	9	File system, File access	L2, L3
5	Overview of message passing, Implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Resource state modelling, Deadlock detection algorithm, Deadlock prevention	10	Data sharing, deadlock	L2, L3

3. Course Material

Module	Details	Available
1	Text books	
	Operating Systems – A concept based approach by Dhamdare, TMH, 2nd edition.	In Lib In dept
2	Reference books	
	1. Operating systems concepts, Silberschatz and Galvin, John Wiley India pvt. Ltd, 5th edition, 2001	In lib
	2. Operating system – internals and design system, William Stalling, Pearson Education, 4th ed, 2006.	In lib
	3. Design of operating systems, Tannanbhaum, TMH, 2001	In lib
3	Others (Web, Video, Simulation, Notes etc.)	

4. Course Prerequisites

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1						

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

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B. OBE PARAMETERS

1. Course Outcomes

#	COs	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
17EC553.1	Understand the goals, structure and operation of OS	4	Operation of OS	Lecture	Slip Test	L2 Understand
17EC553.2	Compare 5 different classes of OS	6	classes of OS	Lecture	Assignment	L2 Understand
17EC553.3	Understand the concept of threads to achieve process concurrency	5	Threads in process	Lecture	Assignment and Slip Test	L2 Understand
17EC553.4	Apply scheduling techniques to find performance factors	6	Process Scheduling	Lecture / PPT	Assignment	L3 Apply
17EC553.5	Apply suitable techniques for contiguous and non-contiguous memory allocation	6	Memory allocation	Lecture	Slip test	L3 Apply
17EC553.6	Illustrate page replacement policies to find the performance	5	Virtual memory	Lecture and Tutorial	Assignment	L3 Apply
17EC553.7	Explain the operations supported by the file system and IOCS	5	File system	Lecture	Assignment and Slip Test	L2 Understand
17EC553.8	Implement file access using directory structure and FCB	4	File access	Lecture	Slip test	L3 Apply
17EC553.9	Understand inter-process communication using message passing	4	Data sharing	Lecture	Assignment	L2 Understand
17EC553.10	Solve the problems of deadlock during resource allocation	6	Deadlock	Lecture and Tutorial	Slip test	L3 Apply
-	**Total**	**51**	-	-	-	-

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

2. Course Applications

SNo	Application Area	CO	Level
1	Linux operating system working	CO1	L2
2	Automated transaction processing	CO2	L2
3	Multi-threading by time slicing	CO3	L2
4	Human resource management	CO4	L3
5	Video games	CO5	L3
6	File swapping	CO6	L3

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7	Multiple file system within a single system	CO7	L2
8	Directory structure	CO8	L3
9	Message oriented middleware	CO9	L2
10	Resource management	CO10	L3

3. Articulation Matrix

(CO – PO MAPPING)

–	Course Outcomes	Program Outcomes												
#	COs	PO 1	PO2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	Level
17EC553.1	Understand the goals, structure and operation of OS	3												L2
17EC553.2	Compare 5 different classes of OS	3												L2
17EC553.3	Understand the concept of threads to achieve process concurrency	3												L2
17EC553.4	Apply scheduling techniques to find performance factors	3	2											L3
17EC553.5	Apply suitable techniques for contiguous and non-contiguous memory allocation	3	2											L3
17EC553.6	Illustrate page replacement policies to find the performance	3	2											L3
17EC553.7	Explain the operations supported by the file system and IOCS	3												L2
17EC553.8	Implement file access using directory structure and FCB	3												L3
17EC553.9	Understand inter-process communication using message passing	3												L2
17EC553.10	Solve the problems of deadlock during resource allocation	3	2	1										L3
Note: Mention the mapping strength as 1, 2, or 3														

4. Mapping Justification

Mapping	Justification	Mapping Level

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CO	PO	-	-
CO1	PO1	Knowledge of OS is required for understanding software problems.	3
CO2	PO1	Knowledge of classes of OS is required for developing new software.	3
CO3	PO1	Knowledge of threads is required for writing programs	3
CO4	PO1	Knowledge of scheduling techniques is required for real time program development	3
CO4	PO2	Analyzing problem in OS requires knowledge of scheduling techniques	2
CO5	PO1	Knowledge of memory allocation is required for proper utilization of memory	3
CO5	PO2	Analyzing problems in memory utilization requires knowledge of memory allocation	2
CO6	PO1	Knowledge of page replacement policies is required to manage memory related problems	3
CO6	PO2	Analyzing problems in memory management requires knowledge of page replacement policies.	2
CO7	PO1	Knowledge of file system and IOCS is required for solving file related problems	3
CO8	PO1	Knowledge of directory structure is required for solving file related problems	3
CO9	PO1	Knowledge of inter-process communication is required for solving communication related problems	3
CO10	PO1	Knowledge of Deadlock is required for solving resource related problems	3
CO10	PO2	Analyzing problems in resource management requires knowledge of deadlocks	2
CO10	PO3	Deadlock prevention is necessary for proper management of resources	1

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

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Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Introduction to operating system	10	2	-	-	1	1	2	CO1, CO2	L2, L2
2	Process management	11	2	-	-	1	1	2	CO3, CO4	L2, L3
3	Memory management	11	-	2	-	1	1	2	CO5, CO6	L3, L3
4	File systems	9	-	2	-	1	1	2	CO7, C08	L2, L3
5	Message passing and deadlocks	10	-	-	4	1	1	2	CO9, CO10	L2, L3
-	**Total**	**51**	**4**	**4**	**4**	**5**	**5**	**10**	-	-

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

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2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	15	CO1, CO2, CO3, CO4	L2, l2, l2, l3
CIA Exam – 2	15	CO5, CO6, CO7, C08	L3, L3, L2, L3
CIA Exam – 3	15	CO9, CO10	L2, L3
Assignment – 1	03	CO1, CO2, CO3, CO4	L2, l2, l2, l3
Assignment – 2	03	CO5, CO6, CO7, CO8	L3, L3, L2, L3
Assignment – 3	03	CO9, CO10	L2, L3
Seminar – 1	02	CO1, CO2, CO3, CO4	L2, l2, l2, l3
Seminar – 2	02	CO5, CO6,CO7,CO8	L3, L3, L2, L3
Seminar – 3	02	CO9, CO10	L2, L3
Other Activities – define – Slip test			
Final CIA Marks	**20**	**-**	**-**

Note : Blooms Level in last column shall match with A.2 above.

D1. TEACHING PLAN – 1

Module – 1

Title:	Introduction to operating system	Appr Time:	16 Hrs
a	***Course Outcomes***	–	**Blooms**
–	The student should be able to:	–	**Level**
1	Understand the goals, structure and operation of OS	CO1	L2
2	Compare 5 different classes of OS	CO2	L2
b	***Course Schedule***	–	–
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction to OS, Goals of an OS, Operation of OS	CO1	L1
2	Computational structures,	CO1	L2
3	Resource allocation techniques	CO1	L2
4	Efficiency, System Performance and User Convenience	CO1	L2
5	Classes of Operating System	CO2	L1
6	Batch processing	CO2	L2
7	Multi-programming	CO2	L3
8	Time sharing systems	CO2	L2

9	Real time Operating System	CO2	L2
10	Distributed Operating System	CO2	L2
c	**Application Areas**	**CO**	**Level**
1	Linux operating system working	CO1	L2
2	Automated transaction processing	CO2	L2
d	**Review Questions**	-	-
1	Discuss the common tasks performed by an operating system.	CO1	L1
2	Explain the resource pre-emption, resource allocation strategies of an OS.	CO1	L2
3	What is a distributed system? Discuss the key concepts, techniques and benefits of distributed OS.	CO2	L2
4	What is O.S? What are the common tasks performed by an O.S and when they are performed?	CO1	L2
5	Explain turn-around time in batch processing system	CO1	L2
6	Explain the goals of an operating system.	CO1	L2
7	Explain the designer's view of operating system.	CO1	L2
8	Explain modes of performing I/O operations.	CO1	L2
9	Explain the benefits/features of distributed operating system.	CO2	L2
10	Define an operating system. What are the facets of user convenience?	CO1	L1
11	Explain partition based and pool based resource allocation strategies.	CO1	L2
12	Explain time sharing operating system with respect to (i) Scheduling and (ii) memory management	CO2	L2
13	Describe the batch processing system and functions of scheduling and memory management for the same.	CO2	L2
14	Why I/O bound programs should be given higher priorities in a multi programming environment? Illustrate with timing diagram.	CO2	L3
15	Explain the features and special techniques of distributed operating system	CO2	L2
16	Explain briefly the key features of different classes of operating system.	CO2	L2
17	Explain the concepts of memory compaction and virtual memory with respect to memory management.	CO1	L2
18	Define operating system. Explain the functions of an operating system.	CO1	L2
19	Differentiate sequential sharing and concurrent sharing devices, with examples.	CO1	L2
20	Briefly explain the different classes of operating systems, specifying the primary concern and key concepts used.	CO1	L2
21	Discuss the spooling technique with a block representation. Also highlight the importance of distributed operating systems.	CO2	L2

e	**Experiences**		
1			
2			
3			
4			
5			

Module – 2

Title:	Divide and Conquer	Appr Time:	10 Hrs
a	***Course Outcomes***	–	**Blooms**
–	The student should be able to:	–	**Level**
1	Understand the concept of threads to achieve process concurrency	CO3	L4
2	Apply scheduling techniques to find performance factors	CO4	L3
b	***Course Schedule***	–	–
Class No	**Module Content Covered**	**CO**	**Level**
11	OS view of Processes	CO3	L1
12	PCB	CO3	L2
13	Fundamental state transitions	CO3	L2
14	Threads, Kernel level Threads	CO3	L2
15	User level Threads	CO3	L2
16	Non-Preemptive scheduling-FCFS	CO4	L3
17	Non-Preemptive scheduling-SRN	CO4	L3
18	Preemptive Scheduling-RR	CO4	L3
19	Preemptive Scheduling- LCN	CO4	L3
20	Long term, medium term scheduling in a time sharing system.	CO4	L2
21	short term scheduling in a time sharing system.	CO4	L2
c	**Application Areas**	**CO**	**Level**
1	Multi-threading by time slicing	CO3	L2
2	Human resource management	CO4	L3
d	**Review Questions**	–	–
22	Discuss the primary concerns/reasons for process termination.	CO3	L2
23	List the events occur during the operation of OS. With a diagram discuss the event handling actions of kernel.	CO3	L2
24	With a diagram, explain the relationship between threads and processes. Discuss the advantages of threads.	CO3	L2

25	Define a process. List the different fields of a process control block.	CO3	L2
26	Explain the four fundamental states of a process with state transition diagram.	C03	L2
27	What are the advantages of threads over process? Explain kernel level threads.	CO3	L2
28	List the different types of process interaction and explain them in brief.	CO3	L2
29	Explain with a neat diagram, the different states of process in UNIX operating system.	CO3	L2
30	What is a process? What are the components of a process? Explain.	CO3	L2
31	Explain with neat diagrams: (i) User threads (ii) Kernel level threads.	CO3	L2
32	Mention the three kinds of entities used for concurrency within a process in threads in Solaris, along with a diagram.	CO3	L2
33	With a state transition diagram and PCB structure, explain the function of states, state transitions and the functions of a schedule.	CO3	L2
34	Explain the race condition in airline reservation system with an algorithm .	CO3	L2
35	Explain 'Event Handling' pertaining to a process.	CO3	L2
36	Explain arrangement and working of threads in Solaris with a neat block diagram.	CO3	L2
37	Explain the control synchronization and the data access synchronization, with examples.	CO3	L2
38	What is a thread? List its advantages.	CO3	L2
39	Explain in detail the programmer view of processes. With interaction between processes, highlight the remarks for its interaction.	CO3	L2
40	With a neat diagram, explain the event handling and scheduling.	CO4	L2
41	Determine the mean turn-around time and mean weighted turn around for LCN and STG scheduling for the following table:	CO4	L3
42	Discuss the two fundamental techniques of scheduling.	CO4	L2
43	With diagram explain the working of a long, medium and short term scheduling in a time sharing system.	CO4	L2
44	For the following given process for scheduling.	CO4	L3

Process	Arrival time (sec)	Execution time (sec)	Dead line time (sec)
P_1	0	03	04
P_2	2	03	14
P_3	3	02	06
P_4	5	05	11
P_5	8	03	12

Process	P_1	P_2	P_3	P_4	P_5
Admission time	0	2	3	4	8
Service time	3	3	5	2	3

Calculate mean turn-around time and mean weighted turn around for

<table>
<tr><td></td><td>the (i) FCFS scheduling (ii) Round-Robin scheduling with time slicing (δ) for 1 second.</td><td></td><td></td></tr>
<tr><td>45</td><td>Compute mean turn-around time and mean weighted turn-around time for following set of processes, using FCFS and SRN scheduling.

<table><tr><td>Process</td><td>P_1</td><td>P_2</td><td>P_3</td><td>P_4</td><td>P_5</td></tr><tr><td>Arrival time</td><td>0</td><td>2</td><td>3</td><td>5</td><td>8</td></tr><tr><td>Service time</td><td>3</td><td>3</td><td>2</td><td>5</td><td>3</td></tr></table></td><td>CO4</td><td>L3</td></tr>
<tr><td>46</td><td>Explain the process schedule with a neat schematic diagram.</td><td>CO4</td><td>L2</td></tr>
<tr><td>47</td><td>Summarize the approaches of real time scheduling.</td><td>CO4</td><td>L2</td></tr>
<tr><td>48</td><td>Compare (i) Preemptive and non-preemptive scheduling
(ii) Long term and short term schedulers.</td><td>CO4</td><td>L2</td></tr>
<tr><td>49</td><td>Describe the shortest request next (SRN) and highest response ratio next (HRN) scheduling policies and determine the average turn-around time and weighted turn-around time for the following set of processes shown in the table below:
<table><tr><td>Process</td><td>P_1</td><td>P_2</td><td>P_3</td><td>P_4</td><td>P_5</td></tr><tr><td>Arrival time</td><td>0</td><td>2</td><td>3</td><td>4</td><td>8</td></tr><tr><td>Service time</td><td>3</td><td>3</td><td>5</td><td>2</td><td>3</td></tr></table></td><td>CO4</td><td>L3</td></tr>
<tr><td>50</td><td>What are the functions of medium and short term schedulers?</td><td>CO4</td><td>L2</td></tr>
<tr><td>51</td><td>Determine mean turn-around time for SJN and RR scheduling, assuming a time slice of 1 second for the following table:

<table><tr><td>Process</td><td>Arrival time (sec)</td><td>Execution time (sec)</td><td>Dead line time (sec)</td></tr><tr><td>P_1</td><td>0</td><td>03</td><td>04</td></tr><tr><td>P_2</td><td>2</td><td>03</td><td>14</td></tr><tr><td>P_3</td><td>3</td><td>02</td><td>06</td></tr><tr><td>P_4</td><td>5</td><td>05</td><td>11</td></tr><tr><td>P_5</td><td>8</td><td>03</td><td>12</td></tr></table></td><td>CO4</td><td>L3</td></tr>
<tr><td>52</td><td>Describe the various blocks in a long term scheduling with JCB structure.</td><td>CO4</td><td>L2</td></tr>
<tr><td>53</td><td>With a neat block diagram, explain about the event handling and scheduling.</td><td>CO4</td><td>L2</td></tr>
<tr><td>54</td><td>Explain the scheduling in UNIX.</td><td>CO4</td><td>L2</td></tr>
<tr><td>55</td><td>What do you mean by non-preemptive and preemptive scheduling policies? Explain i) LCN and ii)STG policies.</td><td>CO4</td><td>L2</td></tr>
<tr><td>56</td><td>Explain briefly the mechanism and policy modules of short term process scheduler with a neat block diagram.</td><td>CO4</td><td>L2</td></tr>
<tr><td>57</td><td>Briefly explain the features of time sharing system. Also explain process state transitions in time sharing system.</td><td>CO4</td><td>L2</td></tr>
<tr><td>58</td><td>What is scheduling? What are the events related to scheduling? With</td><td>CO4</td><td>L2</td></tr>
</table>

	block view, explain the event control block and handler		
59	Describe the static, dynamic and priority based scheduling in real time systems. Also explain the modes of process scheduling done in unix	CO4	L2
e	**Experiences**	–	–
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper – 1

Crs Code:	15EC553	Sem:	V	Marks:	30	Time:	75 minutes
Course:	Operating system						

-	-	**Note: Answer any 1 question from each part.**	**Marks**	**CO**	**Level**
		PART A			
1	a	Define an operating system. What are the facets of user convenience?	5	CO1	L1
	b	Explain partition based and pool based resource allocation strategies.	5	CO1	L2
	c	Explain time sharing operating system with respect to Scheduling	5	CO1	L2
		OR			
2	a	Briefly explain the different classes of operating systems, specifying the primary concern and key concepts used.	8	CO2	L2
	b	Explain the features and special techniques of distributed operating system	7	CO2	L2
		PART-B			
3	a	With a diagram, explain the relationship between threads and processes. Discuss the advantages of threads.	7	CO3	L2
	b	Explain the four fundamental states of a process with state transition diagram.	8	CO3	L2
		OR			
4	a	Determine the mean turn-around time and mean weighted turn around for LCN and STG scheduling for the following table:	7	CO4	L3

Process	Arrival time (sec)	Execution time (sec)	Dead line time (sec)
P_1	0	03	04
P_2	2	03	14
P_3	3	02	06

		P_4	5	05	11			
		P_5	8	03	12			
	b	For the following given process for scheduling. Process: P_1 P_2 P_3 P_4 P_5 Admission time: 0 2 3 4 8 Service time: 3 3 5 2 3 Calculate mean turn-around time and mean weighted turn around for the (i) FCFS scheduling (ii) Round-Robin scheduling with time slicing (δ) for 1 second.					8	CO4	L3

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15EC553	Sem:	5	Marks:	5 / 10	Time:	90 - 120 minutes
Course:	Operating system						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Discuss the common tasks performed by an operating system.	5	CO1	L1
2		Explain the resource pre-emption, resource allocation strategies of an OS.	7	CO1	L2
3		What is a distributed system? Discuss the key concepts, techniques and benefits of distributed OS.	8	CO2	L2
4		What is O.S? What are the common tasks performed by an O.S and when they are performed?	7	CO1	L2
5		Explain turn-around time in batch processing system	6	CO1	L2
6		Explain the goals of an operating system.	6	CO1	L2
7		Explain the designer's view of operating system.	4	CO1	L2
8		Explain modes of performing I/O operations.	5	CO1	L2
9		Explain the benefits/features of distributed operating system.	5	CO2	L2
10		Define an operating system. What are the facets of user convenience?	6	CO1	L1
11		Explain partition based and pool based resource allocation strategies.	6	CO1	L2
12		Explain time sharing operating system with respect to (i) Scheduling and (ii) memory management	8	CO2	L2
13		Describe the batch processing system and functions of scheduling and memory management for the same.	8	CO2	L2
14		Why I/O bound programs should be given higher priorities in	8	CO2	L3

		a multi programming environment? Illustrate with timing diagram.			
15		Explain the features and special techniques of distributed operating system	8	CO2	L2
16		Explain briefly the key features of different classes of operating system.	10	CO2	L2
17		Explain the concepts of memory compaction and virtual memory with respect to memory management.	5	CO1	L2
18		Define operating system. Explain the functions of an operating system.	6	CO1	L2
19		Differentiate sequential sharing and concurrent sharing devices, with examples.	5	CO1	L2
20		Briefly explain the different classes of operating systems, specifying the primary concern and key concepts used.	9	CO1	L2
21		Discuss the spooling technique with a block representation. Also highlight the importance of distributed operating systems.	10	CO2	L2
22		Discuss the primary concerns/reasons for process termination.	5	CO3	L2
23		List the events occur during the operation of OS. With a diagram discuss the event handling actions of kernel.	8	CO3	L2
24		With a diagram, explain the relationship between threads and processes. Discuss the advantages of threads.	7	CO3	L2
25		Define a process. List the different fields of a process control block.	6	CO3	L2
26		Explain the four fundamental states of a process with state transition diagram.	7	C03	L2
27		What are the advantages of threads over process? Explain kernel level threads.	7	CO3	L2
28		List the different types of process interaction and explain them in brief.	8	CO3	L2
29		Explain with a neat diagram, the different states of process in UNIX operating system.	8	CO3	L2
30		What is a process? What are the components of a process? Explain.	6	CO3	L2
31		Explain with neat diagrams: (i) User threads (ii) Kernel level threads.	8	CO3	L2
32		Mention the three kinds of entities used for concurrency within a process in threads in Solaris, along with a diagram.	4	CO3	L2
33		With a state transition diagram and PCB structure, explain the function of states, state transitions and the functions of	8	CO3	L2

<table>
<tr><td></td><td></td><td>a schedule.</td><td></td><td></td><td></td></tr>
<tr><td>34</td><td></td><td>Explain the race condition in airline reservation system with an algorithm .</td><td>8</td><td>CO3</td><td>L2</td></tr>
<tr><td>35</td><td></td><td>Explain ‘Event Handling’ pertaining to a process.</td><td>10</td><td>CO3</td><td>L2</td></tr>
<tr><td>36</td><td></td><td>Explain arrangement and working of threads in Solaris with a neat block diagram.</td><td>10</td><td>CO3</td><td>L2</td></tr>
<tr><td>37</td><td></td><td>Explain the control synchronization and the data access synchronization, with examples.</td><td>8</td><td>CO3</td><td>L2</td></tr>
<tr><td>38</td><td></td><td>What is a thread? List its advantages.</td><td>4</td><td>CO3</td><td>L2</td></tr>
<tr><td>39</td><td></td><td>Explain in detail the programmer view of processes. With interaction between processes, highlight the remarks for its interaction.</td><td>10</td><td>CO3</td><td>L2</td></tr>
<tr><td>40</td><td></td><td>With a neat diagram, explain the event handling and scheduling.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>41</td><td></td><td>Determine the mean turn-around time and mean weighted turn around for LCN and STG scheduling for the following table:
<table>
<tr><td>Process</td><td>Arrival time (sec)</td><td>Execution time (sec)</td><td>Dead line time (sec)</td></tr>
<tr><td>P_1</td><td>0</td><td>03</td><td>04</td></tr>
<tr><td>P_2</td><td>2</td><td>03</td><td>14</td></tr>
<tr><td>P_3</td><td>3</td><td>02</td><td>06</td></tr>
<tr><td>P_4</td><td>5</td><td>05</td><td>11</td></tr>
<tr><td>P_5</td><td>8</td><td>03</td><td>12</td></tr>
</table></td><td>8</td><td>CO4</td><td>L3</td></tr>
<tr><td>42</td><td></td><td>Discuss the two fundamental techniques of scheduling.</td><td>4</td><td>CO4</td><td>L2</td></tr>
<tr><td>43</td><td></td><td>With diagram explain the working of a long, medium and short term scheduling in a time sharing system.</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>44</td><td></td><td>For the following given process for scheduling.
<table>
<tr><td>Process</td><td>P_1</td><td>P_2</td><td>P_3</td><td>P_4</td><td>P_5</td></tr>
<tr><td>Admission time</td><td>0</td><td>2</td><td>3</td><td>4</td><td>8</td></tr>
<tr><td>Service time</td><td>3</td><td>3</td><td>5</td><td>2</td><td>3</td></tr>
</table>
Calculate mean turn-around time and mean weighted turn around for the (i) FCFS scheduling (ii) Round-Robin scheduling with time slicing (δ) for 1 second.</td><td>10</td><td>CO4</td><td>L3</td></tr>
<tr><td>45</td><td></td><td>Compute mean turn-around time and mean weighted turn-around time for following set of processes, using FCFS and SRN scheduling.
<table>
<tr><td>Process</td><td>P_1</td><td>P_2</td><td>P_3</td><td>P_4</td><td>P_5</td></tr>
<tr><td>Arrival time</td><td>0</td><td>2</td><td>3</td><td>5</td><td>8</td></tr>
<tr><td>Service time</td><td>3</td><td>3</td><td>2</td><td>5</td><td>3</td></tr>
</table></td><td>10</td><td>CO4</td><td>L3</td></tr>
<tr><td>46</td><td></td><td>Explain the process schedule with a neat schematic diagram.</td><td>5</td><td>CO4</td><td>L2</td></tr>
<tr><td>47</td><td></td><td>Summarize the approaches of real time scheduling.</td><td>5</td><td>CO4</td><td>L2</td></tr>
</table>

<table>
<tr><td>48</td><td></td><td>Compare (i) Preemptive and non-preemptive scheduling
(ii) Long term and short term schedulers.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>49</td><td></td><td>Describe the shortest request next (SRN) and highest response ratio next (HRN) scheduling policies and determine the average turn-around time and weighted turn-around time for the following set of processes shown in the table below:</td><td>12</td><td>CO4</td><td>L3</td></tr>
<tr><td>50</td><td></td><td>What are the functions of medium and short term schedulers?</td><td>4</td><td>CO4</td><td>L2</td></tr>
<tr><td>51</td><td></td><td>Determine mean turn-around time for SJN and RR scheduling, assuming a time slice of 1 second for the following table:
<table>
<tr><th>Process</th><th>Arrival time (sec)</th><th>Execution time (sec)</th><th>Dead line time (sec)</th></tr>
<tr><td>P_1</td><td>0</td><td>03</td><td>04</td></tr>
<tr><td>P_2</td><td>2</td><td>03</td><td>14</td></tr>
<tr><td>P_3</td><td>3</td><td>02</td><td>06</td></tr>
<tr><td>P_4</td><td>5</td><td>05</td><td>11</td></tr>
<tr><td>P_5</td><td>8</td><td>03</td><td>12</td></tr>
</table></td><td>8</td><td>CO4</td><td>L3</td></tr>
<tr><td>52</td><td></td><td>Describe the various blocks in a long term scheduling with JCB structure.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>53</td><td></td><td>With a neat block diagram, explain about the event handling and scheduling.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>54</td><td></td><td>Explain the scheduling in UNIX.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>55</td><td></td><td>What do you mean by non-preemptive and preemptive scheduling policies? Explain i) LCN and ii)STG policies.</td><td>8</td><td>CO4</td><td>L2</td></tr>
<tr><td>56</td><td></td><td>Explain briefly the mechanism and policy modules of short term process scheduler with a neat block diagram.</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>57</td><td></td><td>Briefly explain the features of time sharing system. Also explain process state transitions in time sharing system.</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>58</td><td></td><td>What is scheduling? What are the events related to scheduling? With block view, explain the event control block and handler</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>59</td><td></td><td>Describe the static, dynamic and priority based scheduling in real time systems. Also explain the modes of process scheduling done in unix</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

D2. TEACHING PLAN - 2

Module - 3

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Apply suitable techniques for contiguous and non-contiguous memory allocation	CO5	L3
2	Illustrate page replacement policies to find the performance	CO6	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
22	Contiguous memory allocation	CO5	L3
23	Non-contiguous memory allocation	CO5	L3
24	Non-contiguous memory allocation	CO5	L3
25	Paging	CO5	L2
26	Segmentation	CO5	L2
27	Segmentation with paging	CO5	L2
28	Virtual Memory Management	CO6	L2
29	Demand paging	CO6	L2
30	Paging hardware	CO6	L2
31	VM handler, FIFO	CO6	L3
32	LRU page replacement policies	CO6	L3
c	**Application Areas**	**CO**	**Level**
1	Video games	CO5	L3
2	File swapping	CO6	L3
d	**Review Questions**	-	-
60	Explain the lazy buddy allocator and slab allocator.	CO5	L2
61	With a diagram, explain the merging of free memory areas using boundary tag.	CO5	L2
62	Compare between contiguous and non-contiguous memory allocation.	CO5	L2
63	Explain the working of a buddy system allocator.	CO5	L2
64	Explain first fit and best fit technique used to perform a fresh allocation from a free list.	CO5	L2
65	Describe static and dynamic memory allocation.	CO5	L2
66	Explain the techniques used to perform memory allocation by using a free list.	CO5	L2

67	Explain internal and external fragmentation with examples.	CO5	L2
68	Compare static and dynamic memory allocation. What are the four program components for which the memory is to be allocated?	CO5	L2
69	Describe: (i) Best fit technique for free space allocation and (ii) variable partitioned allocation with their merits and demerits.	CO5	L2
70	Describe buddy system allocator for program controlled data. How does it differ from process-of-two allocator?	CO5	L2
71	Describe the features of static and dynamic memory allocation.	CO5	L2
72	Write a note no contiguous memory allocation.	CO5	L2
73	Explain about slab allocator of solaris 2.4 system.	CO5	L2
74	What is memory fragmentation? Discuss the method of memory compaction and reuse of memory concepts to overcome the problem of memory fragmentations, give examples.	CO5	L3
75	With a neat diagram, mention the components of a memory allocation to a program during its execution. Also describe the memory allocation preliminaries.	CO5	L2
76	Enumerate the practical issues in contiguous and non-contiguous memory allocation.	CO5	L3
77	With a diagram explain the following: **(i)** Practical page replacement policy. **(ii)** Page replacement policy using clock algorithms.	CO6	L3
78	Explain with diagram, the copy_on_write for shared pages.	CO6	L2
79	With diagram, explain virtual memory manager's action in demand loading of a page.	CO6	L2
80	Explain what are the functions performed by paging hardware.	CO6	L2
81	What are the functions of VM handler? Give the data structures of VM handler.	CO6	L1
82	Consider the page reference string 5,4,3,2,1,4,3,5,4,3,2,1,5. How many page faults would occur for the following page replacement policies assuming 3 frames? (i)FIFO (ii) LRU	CO6	L3
83	Explain the important concepts in the operation of demand paging.	CO6	L2
84	What are the functions performed by the virtual memory manager? Explain.	CO6	L2
85	For the following page reference string, calculate the number of page faults with FIFO and LRU page replacement policies when i) Number of page frames are three ii) Number of page frames are four. Page reference string : 5 4 3 2 1 4 3 5 4 3 2 1 5 Reference time string : $t_1, t_2, t_3, \ldots\ldots\ldots, t_{13}$	CO6	L3
86	Describe the address translation using ATU and TLB in demand paged allocation with a block diagram.	CO6	L2
87	Write a note on page replacement policies.	CO6	L2
88	With a neat diagram, explain the concept of demand paging.	CO6	L2

89	How virtual memory can be implemented?	CO6	L2
90	Describe demand paging, page replacement policy and page sharing in detail.	CO6	L2
e	**Experiences**	–	–
1			
2			
3			
4			
5			

Module – 4

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	***Course Outcomes***	–	**Blooms**
–	The student should be able to:	–	**Level**
1	Explain the operations supported by the file system and IOCS	CO7	L2
2	Implement file access using directory structure and FCB	CO8	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
33	File system and IOCS,	CO7	L2
34	File Operations,	CO7	L2
35	File Organizations,	CO7	L3
36	Directory Structures,	CO7	L2
37	File Protection,	CO7	L2
38	Interface between File system and IOCS,	CO8	L2
39	Allocation of disk space,	CO8	L3
40	Allocation of disk space,	CO8	L3
41	Implementing file access	CO8	L3
c	**Application Areas**	**CO**	**Level**
1	Multiple file system within a single system	CO8	L3
2	Directory structure	CO7	L3
d	**Review Questions**	–	–
91	Explain the following with a diagram: (i) Linked allocation. (ii) File allocation table. (iii) Indexed allocation.	CO8	L3

92	Explain the operations performed on files.	CO7	L3
93	Discuss with a diagram the directory trees of a file system.	CO7	L2
94	With a neat diagram, explain the facilities provided by the file system and input-output control system?	CO7	L2
95	With a figure explain the working of a linked allocation of disk space.	CO8	L3
96	Explain the interface between file system and IOCS.	CO7	L2
97	Explain the organization of sequential access and direct access files.	CO7	L2
98	Describe file system actions during a file operation.	CO7	L2
99	Explain the index sequential file organization with an example.	CO8	L3
100	What is a link? With an example, illustrate the use of a link in an acyclic graph structure directory.	CO8	L3
101	Compare sequential and direct file organization.	CO7	L3
102	Explain the file system actions when a file is opened and when a file is closed.	CO7	L2
103	Explain UNIX file system.	CO7	L2
104	Discuss methods of allocation of disk space with block representation.	CO8	L3
105	Explain briefly linked allocation of disk space with a neat sketch.	CO8	L2
106	Briefly explain File Control Block (FCB).	CO8	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper – 2

Crs Code:	15EC553	Sem:	5	Marks:	20	Time:	75 minutes
Course:							

-	-	**Note: Answer any 1 question from each part.**	**Marks**	**CO**	**Level**
		Part A			
1	a	With a diagram, explain the merging of free memory areas using boundary tag.	8	CO5	L2
	b	Compare between contiguous and non-contiguous memory allocation.	7	CO5	L2
		OR			
2	a	With a diagram explain the following:	8	CO6	L3

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		(iii) Practical page replacement policy. **(iv)** Page replacement policy using clock algorithms.			
	b	What are the functions of VM handler? Give the data structures of VM handler.	7	CO6	L1
		Part B			
3	a	Explain the operations performed on files.	8	CO7	L3
	b	Explain the organization of sequential access and direct access files.	7	CO7	L2
4	a	Discuss methods of allocation of disk space with block representation.	8	CO8	L3
	b	Briefly explain File Control Block (FCB).	7	CO8	L2

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15EC553	Sem:	5	Marks:	5 / 10	Time:	90 – 120 minutes
Course:	Operating Systems						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
60		Explain the lazy buddy allocator and slab allocator.	8	CO5	L2
61		With a diagram, explain the merging of free memory areas using boundary tag.	8	CO5	L2
62		Compare between contiguous and non-contiguous memory allocation.	6	CO5	L2
63		Explain the working of a buddy system allocator.	10	CO5	L2
64		Explain first fit and best fit technique used to perform a fresh allocation from a free list.	8	CO5	L2
65		Describe static and dynamic memory allocation.	4	CO5	L2
66		Explain the techniques used to perform memory allocation by using a free list.	10	CO5	L2
67		Explain internal and external fragmentation with examples.	6	CO5	L2
68		Compare static and dynamic memory allocation. What are the four program components for which the memory is to be allocated?	4	CO5	L2
69		Describe: (i) Best fit technique for free space allocation and (ii) variable partitioned allocation with their merits and demerits.	8	CO5	L2
70		Describe buddy system allocator for program controlled data. How does it differ from process-of-two allocator?	8	CO5	L2

71		Describe the features of static and dynamic memory allocation.	5	CO5	L2
72		Write a note no contiguous memory allocation.	7	CO5	L2
73		Explain about slab allocator of solaris 2.4 system.	8	CO5	L2
74		What is memory fragmentation? Discuss the method of memory compaction and reuse of memory concepts to overcome the problem of memory fragmentations, give examples.	10	CO5	L3
75		With a neat diagram, mention the components of a memory allocation to a program during its execution. Also describe the memory allocation preliminaries.	10	CO5	L2
76		Enumerate the practical issues in contiguous and non-contiguous memory allocation.	10	CO5	L3
77		With a diagram explain the following: **(v)** Practical page replacement policy. **(vi)** Page replacement policy using clock algorithms.	9	CO6	L3
78		Explain with diagram, the copy_on_write for shared pages.	4	CO6	L2
79		With diagram, explain virtual memory manager's action in demand loading of a page.	7	CO6	L2
80		Explain what are the functions performed by paging hardware.	6	CO6	L2
81		What are the functions of VM handler? Give the data structures of VM handler.	6	CO6	L1
82		Consider the page reference string 5,4,3,2,1,4,3,5,4,3,2,1,5. How many page faults would occur for the following page replacement policies assuming 3 frames? (i)FIFO (ii) LRU	8	CO6	L3
83		Explain the important concepts in the operation of demand paging.	12	CO6	L2
84		What are the functions performed by the virtual memory manager? Explain.	8	CO6	L2
85		For the following page reference string, calculate the number of page faults with FIFO and LRU page replacement policies when i) Number of page frames are three ii) Number of page frames are four. Page reference string : 5 4 3 2 1 4 3 5 4 3 2 1 5 Reference time string : $t_1, t_2, t_3, \ldots\ldots\ldots, t_{13}$	12	CO6	L3
86		Describe the address translation using ATU and TLB in demand paged allocation with a block diagram.	8	CO6	L2
87		Write a note on page replacement policies.	8	CO6	L2
88		With a neat diagram, explain the concept of demand	10	CO6	L2

		paging.			
89		How virtual memory can be implemented?	10	CO6	L2
90		Describe demand paging, page replacement policy and page sharing in detail.	10	CO6	L2
91		Explain the following with a diagram: (iv) Linked allocation. (v) File allocation table. (vi) Indexed allocation.	10	CO8	L3
92		Explain the operations performed on files.	8	CO7	L3
93		Discuss with a diagram the directory trees of a file system.	5	CO7	L2
94		With a neat diagram, explain the facilities provided by the file system and input-output control system?	8	CO7	L2
95		With a figure explain the working of a linked allocation of disk space.	7	CO8	L3
96		Explain the interface between file system and IOCS.	8	CO7	L2
97		Explain the organization of sequential access and direct access files.	8	CO7	L2
98		Describe file system actions during a file operation.	4	CO7	L2
99		Explain the index sequential file organization with an example.	8	CO8	L3
100		What is a link? With an example, illustrate the use of a link in an acyclic graph structure directory.	4	CO8	L3
101		Compare sequential and direct file organization.	4	CO7	L3
102		Explain the file system actions when a file is opened and when a file is closed.	8	CO7	L2
103		Explain UNIX file system.	10	CO7	L2
104		Discuss methods of allocation of disk space with block representation.	8	CO8	L3
105		Explain briefly linked allocation of disk space with a neat sketch.	10	CO8	L2
106		Briefly explain File Control Block (FCB).	10	CO8	L2

D3. TEACHING PLAN - 3

Module - 5

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand inter-process communication using message passing	CO9	L2
2	Solve the problems of deadlock during resource allocation	CO10	L3

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b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
42	Overview of message passing	CO9	L2
43	Implementing message passing	CO9	L2
44	Implementing message passing	CO9	L2
45	Mailboxes	CO9	L2
46	Deadlocks	CO10	L2
47	Deadlocks in resource allocation	CO10	L2
48	Resource state modelling	CO10	L2
49	Deadlock detection algorithm	CO10	L3
50	Deadlock detection algorithm	CO10	L3
51	Deadlock prevention	CO10	L2
c	**Application Areas**	**CO**	**Level**
1	Message oriented middleware	CO9	L2
2	Resource management	CO10	L3
d	**Review Questions**	-	-
107	Explain the following: i) Inter process message control block. ii)Exceptional conditions on message passing.	CO9	L2
108	Explain the message queues and sockets for inter process communication in unix.	CO9	L2
109	Explain a mail box with its features and advantages.	CO9	L2
110	Explain the primary issues in implementing message passing	CO9	L2
111	Explain the working of a blocking and non-blocking delivery protocols.	CO9	L2
112	Explain Buffering of inter-process messages.	CO9	L2
113	Describe the delivery of inter-process messages.	CO9	L2
114	Explain i) Direct and In-direct naming. ii)Blocking and non blocking sends	CO9	L2
115	Explain pipes and message queues in UNIX.	CO9	L2
116	Explain the primitives used for the transmission and reception of messages in an OS	CO9	L2
117	Describe message delivery protocols and the exceptional conditions during message delivery with an example.	CO9	L2
118	Explain the inter-process communication mechanisms in UNIX OS.	CO9	L2
119	Write short notes on: 1. Buffering of inter-process messages. 2. Mail boxes. 3. Inter-process communication in UNIX.	CO9	L2

120	Explain i)Symmetric and asymmetric naming ii)Blocking and non-blocking protocols	CO9	L2
121	Write short notes on i) Process and threads ii) Process Control Block	CO9	L2
122	Prove that when the bankers algorithm is applied to a finite set of processes, each with a finite execution time, an unsafe request will become safe in finite time.	CO10	L3
123	Explain deadlocks in resource allocation.	CO10	L2
124	Write a note on handling deadlocks.	CO10	L2
125	Write a note on deadlock prevention.	CO10	L2
126	Compare SISR and MISR systems	CO10	L2
e	**Experiences**	-	-
1			
2			
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4			
5			

E3. CIA EXAM – 3

a. Model Question Paper – 3

Crs Code:	15EC553	Sem:	5	Marks:	30	Time:	75 minutes
Course:	Design and Analysis of Algorithms						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	Explain the message queues and sockets for inter process communication in unix.	8	CO9	L2
	b	Explain a mail box with its features and advantages.	7	CO9	L2
		or			
2	a	Describe message delivery protocols and the exceptional conditions during message delivery with an example.	8	CO9	L2
	b	Explain the inter-process communication mechanisms in UNIX OS.	7	CO9	L2
3	a	Define deadlock. Explain the deadlock handling approaches.	8	CO10	L2
	b	With necessary sketches, explain the different deadlock prevention approaches.	7	CO10	L2
		or			
4	a	Prove that when the bankers algorithm is applied to a finite set of processes, each with a finite execution time, an unsafe request will	8	CO10	L3

		become safe in finite time.			
	b	Compare SISR and MISR systems	7	CO10	L2

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15EC553	Sem:	5	Marks:	5 / 10	Time:	90 – 120 minutes
Course:	Operating System						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
107		Explain the following: i) Inter process message control block. ii)Exceptional conditions on message passing.	7	CO9	L2
108		Explain the message queues and sockets for inter process communication in unix.	8	CO9	L2
109		Explain a mail box with its features and advantages.	7	CO9	L2
110		Explain the primary issues in implementing message passing	6	CO9	L2
111		Explain the working of a blocking and non-blocking delivery protocols.	7	CO9	L2
112		Explain Buffering of inter-process messages.	6	CO9	L2
113		Describe the delivery of inter-process messages.	6	CO9	L2
114		Explain i) Direct and In-direct naming. ii)Blocking and non blocking sends	6	CO9	L2
115		Explain pipes and message queues in UNIX.	6	CO9	L2
116		Explain the primitives used for the transmission and reception of messages in an OS	4	CO9	L2
117		Describe message delivery protocols and the exceptional conditions during message delivery with an example.	8	CO9	L2
118		Explain the inter-process communication mechanisms in UNIX OS.	8	CO9	L2
119		Write short notes on: 1. Buffering of inter-process messages. 2. Mail boxes. 3. Inter-process communication in UNIX.	8	CO9	L2
120		Explain i)Symmetric and asymmetric naming ii)Blocking and non-blocking protocols	6	CO9	L2
121		Write short notes on i) Process and threads ii) Process Control Block	10	CO9	L2

122		Prove that when the bankers algorithm is applied to a finite set of processes, each with a finite execution time, an unsafe request will become safe in finite time.	8	CO10	L3
123		Explain deadlocks in resource allocation.	8	CO10	L2
124		Write a note on handling deadlocks.	6	CO10	L2
125		Write a note on deadlock prevention.	6	CO10	L2
126		Compare SISR and MISR systems	6	CO10	L2

F. EXAM PREPARATION

1. University Model Question Paper

Course:	Operating System					Month / Year	Jan /2018	
Crs Code:	15ec553	Sem:	5	Marks:	80	Time:	180 minutes	

-	**Note**	Answer any FIVE full questions, choosing ONE full question from each module	**Marks**	**CO**	**Level**
1	a	Define operating system. What are the goals of an operating system? Explain.	8	CO1	L2
	b	List and explain the different computational structures of operating system.	8	CO1	L2
		or			
2	a	What are the different classes of operating system? Explain them with their primary concern.	10	CO2	L2
	b	Explain the terms: i) Efficiency ii) system performance iii) User service	6	CO2	L2
3	a	With the help of neat sketch, explain the view of processor.	8	CO3	L2
	b	Define process state. Write a neat sketch, explain the fundamental state transitions of processes.	8	CO3	L2
		or			
4	a	For the given set processes, perform FCFS and SRN scheduling. Compare their performance in terms of mean turn around time and mean weighted turn around time.	10	CO4	L3
	b	Write a neat sketch, explain long-medium and short term schedulers.	6	CO4	L2
5	a	Compare contiguous and non-contiguous memory allocation techniques.	8	CO5	L2

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

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	b	Define: i) Internal and external fragmentation ii) Paging and segmentation iii) Logical address and physical address iv) Page and page frame	8	CO5	L1
		or			
6	a	Write a neat sketch, explain the concepts involved in demand loading of a page.	8	CO6	L2
	b	Explain FIFO and LRU page replacement policies. Show the operation of FIFO and LRU policies for the page reference string: 0, 1, 0, 2, 0, 1, 2 and time reference string: t_1, t_2, t_3, t_4, t_5, t_6, t_7 and find out number of page faults. Given number of page frames = 2.	8	CO6	L3
7	a	Explain the file system and IOCS with necessary sketches.	8	CO7	L2
	b	Explain the fundamental file organizations.	8	CO7	L2
		or			
8	a	What is a directory? Explain directory fields and its operation with a simple directory structure.	8	CO8	L2
	b	Explain the file system actions when a file is opened.	8	CO8	L2
9	a	Define message passing. Illustrate the implementation of message passing.	8	CO9	L2
	b	Define mailbox. Explain message passing using a mailbox with necessary sketches. Also mention the advantages of using mail boxes.	8	CO9	L2
		or			
10	a	Define deadlock. Explain the deadlock handling approaches.	8	CO10	L2
	b	With necessary sketches, explain the different deadlock prevention approaches.	8	CO10	L2

2. SEE Important Questions

Course:	Operating System					Month / Year	May /2018
Crs Code:	15EC553	Sem:	5	Marks:	80	Time:	180 minutes

	Note	Answer all FIVE full questions. All questions carry equal marks.	-	-	
Module	Qno.	Important Question	Marks	CO	Year
1	1	Discuss the common tasks performed by an operating system (OS).	5	CO1	2015
	2	Explain turn-around time in batch processing system	5	CO2	2015
	3	Explain the benefits/features of distributed operating system.	5	CO2	2014

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	4	Explain partition based and pool based resource allocation strategies.	6	CO1	2014
	5	Why I/O bound programs should be given higher priorities in a multi programming environment? Illustrate with timing diagram.	8	C02	2013
2	1	With a diagram, explain the relationship between threads and processes. Discuss the advantages of threads.	7	CO3	2015
	2	Explain the four fundamental states of a process with state transition diagram.	7	CO3	2015
	3	Explain the race condition in airline reservation system with an algorithm	8	CO3	2013
	4	With a neat diagram, explain the event handling and scheduling.	8	C04	2015
	5	With diagram explain the working of a long, medium and short term scheduling in a time sharing system.	10	CO4	2015
3	1	Compare between contiguous and non-contiguous memory allocation.	6	CO5	2015
	2	Explain first fit and best fit technique used to perform a fresh allocation from a free list.	8	CO5	2015
	3	Describe static and dynamic memory allocation.	4	C05	2014
	4	What are the functions of VM handler? Give the data structures of VM handler.	6	CO6	2015
	5	Consider the page reference string 5,4,3,2,1,4,3,5,4,3,2,1,5. How many page faults would occur for the following page replacement policies assuming 3 frames? (i)FIFO (ii) LRU	8	CO6	2014
4	1	Explain the operations performed on files.	5	CO7	2015
	2	Explain the interface between file system and IOCS	5	CO7	2015
	3	Explain the index sequential file organization with an example.	8	CO7	2014
	4	Explain the file system actions when a file is opened and when a file is closed.	8	C08	2015
	5	Briefly explain File Control Block (FCB).	10	C08	2014
5	1	Explain the message queues and sockets for inter process communication in unix.	8	CO9	2015
	2	Explain a mail box with its features and advantages.	7	C09	2015
	3	Explain the working of a blocking and non-blocking delivery protocols	7	CO9	2015
	4	Define deadlock. Explain the deadlock handling approaches.	8	C010	2018
	5	With necessary sketches, explain the different deadlock prevention approaches.	8	CO10	2018