Ref No:

# Sri Krishna Institute of Technology, Bangalore



# Academic Year 2019-2020

Program:	B E – Information Science & Engineering
Semester :	6
Course Code:	17CS64
Course Title:	Operating Systems
Credit / L-T-P:	3/ 2-1-0
Total Contact Hours:	40
Course Plan Author:	SINDHU G

Academic Evaluation and Monitoring Cell

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# A. COURSE INFORMATION

#### **1**. Course Overview

Degree:	BE	Program:	CS
Semester:	2019/6	Academic Year:	2019-20
Course Title:	Operating System	Course Code:	17CS64
Credit / L-T-P:	2-1-0	SEE Duration:	3 HOUR
Total Contact Hours:	40	SEE Marks:	60
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	SINDHU G	Sign	Dt:
Checked By:		Sign	Dt:
CO Targets	CIA Target : 90 %	SEE Target:	65 %

Note: Define CIA and SEE % targets based on previous performance.

### 2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute.

Mod	d Content	<b>Teaching Hours</b>	Blooms Learning
ule			Levels
1	Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. Process Management Process concept; Process scheduling; Operations on processes; Inter process communication	8	L2 Understand, L4 Analyze
2	Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	8	L2 Understand, L3 Apply
3	Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	8	L4 Analyze, L2 Understand
4	Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	8	L3 Apply, L2 Understand
5	Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of	8	L3 Apply, L3 Apply

protection, Access matrix, Implementation of access matrix,		
Access control, Revocation of access rights, Capability-		
Based systems. Case Study: The Linux Operating System:		
Linux history; Design principles; Kernel modules; Process		
management; Scheduling; Memory Management; File		
systems, Input and output; Inter-process communication.		
- Total	40	

#### 3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes

2. Design: Simulation and design tools used – software tools used ; Free / open source

3. Rese	arch: Recent developments on the concepts – publications in journals; cc	onferences	s etc.
Modul	Details	Chapters	Availability
es		in book	
Α	Text books (Title, Authors, Edition, Publisher, Year.)	-	-
1, 2, 3,	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne,	1,2,3,4,5	In Lib / In Dept
4,5	Operating System Principles 7 th edition, Wiley-India, 2006.	,7,8	
В	Reference books (Title, Authors, Edition, Publisher, Year.)	-	-
1,	Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage	1.2.3.4.5	In Lib
2,3,4,5	Learning, 6 thEdition	.7.8	
1.	D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed.	12345	In lib
2,3,4,5	McGraw-Hill, 2013.	78	
1	PC P Bhatt An Introduction to Operating Systems: Concepts and	12245	In lib
2.3.4.5	Practice 4th Edition.PHI(EEE), 2014.	70	
1	William Stallings Operating Systems: Internals and Design Dringiples, 6th	,/,0	lie Lile
1,	Edition Pearson	1,2,3,4,5	in lib
2,3,4,5		,7,8	
C	Concept Videos or Simulation for Understanding	-	-
C1	https://www.tutorialspoint.com/PPS/		
C2	https://vtuplanet.com/notes/		
C3	https;//www.khanacademy.com		
C4	https://www.slideshare.net/ashanrajpar/operating-system-		
	presentation-60556413		
C5	https://nptel.ac.in/contactus.php		
D	Software Tools for Design	-	-
E	Recent Developments for Research	-	-
	Improve efficiency -		
	https://ieeexplore.ieee.org/abstract/document/6891996		
			<u> </u>
F	Others (Web Video Simulation Notes etc.)	_	
1	How Flectron / Vacuum Tubes work ?		
1	https://www.youtube.com/watch?v=nA_tglygvNo		

#### **4. Course Prerequisites**

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content ....

Mod	Course	Course Name	Topic / Description	Sem	Remarks	Blooms
ules	Code					Level
1	18CPS13	С	Introduction to Operating system	1	-	L2
		Programming				Understa
		For Problem				nd
		Solving				
3	17CS34	Computer	Memory system	3	-	L2
		Organization				Understa
						nd
4	17CS35	UNIX system	Introduction to file system and its	3	-	L2
		programming	implementation			Understa
						nd
7,8,9	15CS64	OPERATING	Deadlock handling	6		L2
		SYSTEM				Understa
						nd
-						

#### 5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Mod	Topic / Description	Area	Remarks	Blooms
ules				Level
3	Deadlock detection algorithms	Higher	Gap	Analyze
		Study	A seminar on detection	L4
			algorithms	
5	Design principles of Ubuntu OS	Higher	Gap	Apply
		Study	A seminar on Ubuntu OS	L3

### **B. OBE PARAMETERS**

#### 1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs.

Mod	Course	Course Outcome	Teach. Hours	Instr Method	Assessme	Blooms'
ules	Code.#	At the end of the course, student			nt	Level
		should be able to			Method	
1	17CS64.1	Summarize the basic concepts and	8	Lecture	Question	L2
		functions of operating system,			& Answer	Understand
		Analyze different process			Assignme	, L4
		scheduling algorithms and			nt	Analyze
		measure their performance				
2	17CS64.2	Understand various threading	8	Lecture	Question	L2
		models, Calculate the performance			& Answer	Understand
		of various CPU scheduling			Assignme	, L3
		algorithms			nt	Apply
3	17CS64.3	Analyze various deadlock methods	8	Lecture	Slip Test	L4
		and memory management			Assignme	Analyze, L2
		schemes, Explain various memory			nt	Understand
		management schemes				
4	17CS64.4	Interpret various paging	8	Lecture	Question,	L3
		techniques, Understand			Slip Test	Apply, L2
		organization of files and directories.			& Answer	Understand
					Assignme	
					nt	

5	17CS64.5	Interpret different methods of secondary storage, Show the Design principles of OS w.r.t Linux OS	8	Lecture	Question, Slip Test & Answer Assignme nt	L3 Apply
-	-	Total	40	-	-	L2-L4

#### 2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learnings to ...

Mod	Application Area	CO	Level
ules	Compiled from Module Applications.		
1	For developing the custom OS, It helps for developing various various OS functions.	CO1	L4
2	Mobile Computing, web applications, development tools.	CO2	L3
3	Image editing programs, and communication programs, managed resources can	CO3	L4
	be controlled using mutexes.		
4	To develop operating system, To create computer applications.	CO4	L3
5	Companies , Hospital, To build embedded softwares.	CO5	L3

#### 3. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes								-							
Mod	CO.#	At the end of the course	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS	Lev
ules		student should be able to	1	2	3	4	5	6	7	8	9	10	11	12	O1	02	03	el
1	17CS64.1	Summarize the basic concepts and functions of operating system, Analyze different process scheduling algorithms and measure their performance	2.3	2.3	2.2 5	-	-	0.8 5	-	1.0 5	-	2.3	-	-				L4
2	17CS64.2	Understand various threading models, Calculate the performance of various CPU scheduling algorithms	2.3	2.3	2.2 5	-	-	-	-	-	-	2.3	-	-				L3
3	17CS64.3	Analyze various deadlock methods and memory management schemes, Explain various memory management schemes	2.3	2.3	2.2 5	0.8 5	-	-	-	-	-	2.3	-	-				L4
4	17CS64.4	Interpret various paging techniques, Understand organization of files and directories.	2.3	2.3	2.2 5	-	-	-	-	-	1.2 7	2.3	-	-				L3
5	17CS64.5	Interpret different methods of secondary storage, Show the Design principles of OS w.r.t Linux OS	2.3	2.3	2.2 5	-	-	-	-	-	1.2 7	2.3	1.1	-				L3
-		Average	2.3	2.3	2.2 5	0.8 5	-	0.8 5	-	1.0 5	1.2 7	2.3	1.1	-	-	2.3	2.3	2.25
-	PO, PSO	1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design																

#### 4. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Mod	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
ules					
1	Deadlock detection	Seminar	2 <sup>nd</sup> week / date	-	List from B4
	algorithms				above
2	Design principles of	Seminar	3 <sup>rd</sup> Week	-	
	Ubuntu OS				

# C. COURSE ASSESSMENT

### 1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

Mod	Title	Teach.		No. o	f ques	tion in	Exam		CO	Levels
ules		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		
							Asg			
1	Introduction to operating systems,	8	2	-	-	1	-	2	CO1	L2,L4
	System structures, Operating									
	System Services, Process									
	Management.									
2	Multi-threaded Programming,	8	2	-	-	1	-	2	CO2	L2,L3
	Process Synchronization.									
3	Deadlocks, Memory Management.	8	-	2	-	1	-	2		L4,L2
									CO3	
4	Virtual Memory Management, File	8	-	2		1	-	2	CO4	L3,L2
	System, Implementation of File									
	System.									
5	Secondary Storage Structures,	8	-	-	4	1	-	2	CO5	L3,L3
	Protection, Case Study: The Linux									
	Operating System									
-	Total	40	4	4	4	5	-	10	-	-

### 2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Mod ules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	30	CO1, CO2.	L2,L4,L2,L3
3, 4	CIA Exam – 2	30	CO3,CO4.	L4,L2,L3,L2
5	CIA Exam – 3	30	CO5.	L3,L3.
1, 2	Assignment - 1	10	CO1, CO2.	L2,L4,L2,L3
3, 4	Assignment - 2	10	CO3,CO4.	L4,L2,L3,L2
5	Assignment - 3	10	CO5.	L3,L3
1, 2	Seminar - 1		-	-
3, 4	Seminar - 2		-	-
5	Seminar - 3		_	-
1, 2	Quiz – 1		-	-
3, 4	Quiz – 2		-	-
5	Quiz – 3		_	-
				-
1 - 5	Other Activities – Mini Project	-	-	
	Final CIA Marks	40	-	-

# D1. TEACHING PLAN - 1

### Module - 1

Title:		Appr Time:	10 Hrs
a	Course Outcomes	СО	Blooms
-	The student should be able to:	_	Level
1	Summarizing the basic concepts and functions of operating system	CO1	L2
2	Apply different process scheduling algorithms and measure their performance	CO1	<u> </u>
		001	
b	Course Schedule	-	-
Class No	Portion covered per hour	-	-
1	introduction to operating systems, System structures: What operating systems do; Computer System organization	C01	L2
2	Computer System architecture; Operating System structure; Operating System operations;	C01	L2
3	Process management; Memory management; Storage management; Protection and Security	C01	L2
4	Distributed system; Special-purpose systems	C01	L2
5	Computing environments. Operating System Services	C01	L2
6	User - Operating System interface; System calls; Types of system calls	C01	L4
7	System programs; Operating system design and implementation	C01	L4
8	Operating System structure; Virtual machines	C01	L4
9	Operating System generation; System boot	C01	L4
10	Process Management -Process concept; Process scheduling	C01	L4
11	Operations on processes;Inter process communication	C01	L4
С	Application Areas		
-	Students should be able employ / apply the Module learnings to		
1	web applications, development tools, image editing programs, and communication programs	CO1	L2
2	To create computer applications,embedded softwares	CO1	L4
d	Review Questions		
-			
1	What is an OS? List out the different services that an OS provides. Explain.	<u>CO1</u>	L2
2	Explain the layered approach to structuring of an OS along with a relevant diagram	CO1	L2
3	What are the major activities of an OS with regard to (i) Process management (ii) Memory management.	CO1	L2
4	Explain the fundamental difference between (i) N/W OS and Distributed OS (ii) Web-Based Computing and Embedded Computing.	CO1	L2
5	What is a process? Draw and explain the process state diagram	CO1	L4
6	Explain different scheduling criteria that must be kept in mind while choosing different scheduling algorithms.	CO1	L4
7	What are virtual machines? Explain its advantages with a diagram.	CO1	L4
8	List and explain services provided by an OS that are designed to make using computer system more convenient for users.	CO1	L4
9	What are system calls? With examples explain different categories of system calls.	CO1	L4
10	What is distributed OS? What are the advantages of distributed OS.	CO1	L4
11	Differentiate between (I) Process and thread	CO1	L4
	(ii) short-term and medium term scheduler (iii) User level and Kernel level threads		

	(iv) Waiting and Turn-Around time		
12	What is a PCB? Explain with a neat diagram.	CO1	L4
13	What is interprocess communication? Explain direct and indirect	CO1	L4
	communication with respect to message passing system.		

### Module – 2

Title:		Appr Time:	10 Hrs
a	Course Outcomes	СО	Blooms
-	The student should be able to:	-	Level
1	Understanding various threading models	CO2	L2
2	Analyzing the performance of various CPU scheduling algorithms and	CO2	L3
	threading models		
b	Course Schedule		-
Class	Portion covered per hour	-	-
12	Multi-threaded Programming: Overview: Multithreading models	<u> </u>	12
12	Thread Libraries Threading issues	<u> </u>	
14	Dragoss Schoduling: Dasis concepts: Schoduling Criteria	<u> </u>	
14	Schoduling Algorithms	$\frac{002}{002}$	
15	Scheduling Algorithms Multiple, processor scheduling: Thread scheduling	<u> </u>	
10	Process Synchronization: Synchronization: The critical section	<u> </u>	
/	problem	002	L3
18	Peterson's solution	CO2	L3
19	Synchronization hardware;Semaphores	CO2	L3
20	Classical problems of synchronization; Monitors	CO2	L3
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	Mobile Computing	CO2	L2
2	web applications, development tools	CO2	L3
	Deview Overstiens		
a	Review Questions	-	-
14	Explain the differences between single-threaded and multi threaded processes	002	L2
15	What are the benefits of multi threading? Explain the multi threading models	<u> </u>	12
16	Explain the different threading issues	<u> </u>	
17	Define multithreading. Explain the benefits of multithreading	 CO2	12
18	l ist and explain the different scheduling criteria. Explain priority scheduling with	CO2	12
	an example.	001	
19	Explain critical-section problem and solution to it	CO2	L2
20	Explain Synchronization Hardware in detail.	CO2	L3
21	Explain Readers-writers problem and provide a semaphore solution using	CO2	L3
	semaphores for reads priority problem.		
22	Explain Dining-Philosopher's problem using monitors.	CO2	L3
23	Explain the range of monitors with a schematic view of its structure; write a monitor solution to bounded-buffer problem.	CO2	L3
24	What is busy waiting in a critical section concept? How semaphore is used to	CO2	L3
	solve critical section problem? What are the advantages of semaphore.		
25	What are the requirements that a critical section problem must satisfy?	CO2	L3
26	Consider the following set of processes with arrival time:	CO2	L3

C	Applica	tio	n Areas				0.0	l evel
30	Explain	mι	ultiprocesso	r scheduling.			CO2	L3
	FCFS,SJ ii) What the sche	IF, a IF, a t is edu	a non preem the turn aro Iling algorith	nts inustratif ptive priority und time and ms in (I).	and RR ( waiting	Quantum=2) scheduling. time of each processes for each of		
	P5	for	10	5	2	vention of these processes using		
	P4		5	1	4			
	P3		3	2	3	-		
	P2		0	1	1	-		
	P1		0	10	3	-		
	Proce	SS	Arrival time	Burst time	Priorit y			
29	millisec	onc	ds:				002	∟კ
20	J4 Conside	5 vr +1	no following	5	3	a longth of CDLL burst time sives in	<u> </u>	
	] ]3	3		3	6	_		
	J2	3		5	2	_		
	J1	0		6	4	_		
	Jobs	Ar	rival time	Burst time	Priority			
28	For the preemp priority.	prc tive	e priority sc	d below, dra neduling algo	w Gantt prithm. A	charts usingb preemptive and non larger priority number has higher	CO2	L3
	Draw Ga SJF and	ant RF	t charts and ≀ with time q	calculate the	e waiting heduling	g and turnaround time using FCFS, g aalgorthims.		
	P4		07	3				
	P3		03	2				
	P1 P2		10	0				
	Process		CPU Burst	Arrival time				
27	ii) Calcu Followir	ulir late	nnic charts ng. e the averag s the snapsh	e waiting time	e for each	h of scheduling algorithms.	CO2	
	P5		3	2				
	P4		4	2	-			
	P3		2	1				
	P2		1	0	-			
	P1		10	0	-			
	s		Time	time	-			
	Proce	es	Burst	Arrival				

1	Mobile (	Computing				CO2	L2
2	web applications, development tools			CO2	L3		
D	Review	Questions				-	-
14	Explain the differences between single-threaded and multi threaded processes				CO2	L2	
	using neat diagram.						
15	What are the benefits of multi threading? Explain the multi threading models				ain the multi threading models	CO2	L2
10	Explain	the different thi	reading issues	S.		CO2	L2
1/		nuttithreading.	Explain the be	enents of n	hultithreading.	CO2	L2
18	List and explain the different scheduling chiena. Explain phonty scheduling wi						L2
10	Explain	critical-section	problem and	solution to	o it.	CO2	12
20	Explain	Svnchronizatio	n Hardware in	detail.		CO2	   L3
21	Explain	Readers-write	rs problem a	and provid	te a semaphore solution using	CO2	<u>5</u>
	semaph	ores for reads	oriority proble	em.	3		
22	Explain	Dining-Philoso	oher's probler	m using ma	onitors.	CO2	L3
23	Explain	the range of r	nonitors with	a schema	atic view of its structure; write a	CO2	L3
	monitor	solution to bou	Inded-buffer	problem.			
24	What is	busy waiting i	n a critical se	ction conc	cept? How semaphore is used to	CO2	L3
	solve cr	nical section pr	oplem? What	are the ad	ivaritages of semaphore.	<u> </u>	
25	Conside	e the requirem		cooc with a	n problem must satisfy?	CO2	
20					arrivat time.	002	∟3
	Proce	s Burst	Arrival				
	S	Time	time				
	P1	10	0				
	P2	1	0				
	P3	2	1	-			
	P4	4	2	-			
	P5	3	2				
	i) Draw	Ganntt charts	using FCFS,	SJF Preer	mptive and non preemptive		
	sched	uling.		<b>c</b> 1			
	ii) Calcu	late the averag	e waiting time	e for each o	of scheduling algorithms.		
27	Followir	ig is the snapsh	not of a cpu			CO2	L3
	Process	CPU Burst	Arrival time				
	P1	10	0				
	P2	29	1				
	P3	03	2				
	P4	07	3				
28	Draw Ga SJF and For the preemp	antt charts and RR with time of processes liste tive priority sc	calculate the uantum 10 sc d below, dra heduling algo	e waiting a heduling a w Gantt ch prithm. A la	and turnaround time using FCFS, aalgorthims. harts usingb preemptive and non arger priority number has higher	CO2	L3
	Jobs	Arrival time	Burst time	Priority			
	J1	0	6	4			
	J2	3	5	2			
	J3	3	3	6			
	J4	5	5	3			
29	Conside	r the following	set of proces	ses, with l	ength of CPU burst time given in	CO2	L3

	millisecond	ds:					
	Process	Arrival	Burst	Priorit			
		time	time	У			
	P1	0	10	3			
	P2	0	1	1			
	P3	3	2	3			
	P4	5	1	4			
	P5	10	5	2			
	I) draw fou FCFS,SJF, a ii) What is the schedu	ur Gantt cha a non preemp the turn arou Iling algorithr	rts illustratir otive priority Ind time and ms in (I).	ng the e and RR (( waiting	xcution of these processes using Quantum=2) scheduling. time of each processes for each of		
30	Explain mu	ultiprocessor	scheduling.			CO2	L3

# E1. CIA EXAM – 1

### a. Model Question Paper - 1

Crs Code:			Sem:		Marks:		Time:			
Cour	se:									
-	-	Note: Answ	er all quest	ions, each c	arry equal r	narks. Modu	ule : 1, 2	Marks	CO	Level
1	а	What is an (	OS? List out	the differen	t services the	at an OS pro	vides. Expla	ain 5	CO1	L2
	b	Explain the	following C	omputer- Sy	/stem Archite	ecture:		5	CO1	L2
		(i) Multi Proc				115			<u> </u>	
	C	what are sy	stem calls?	Explain dill		or system ca	aus.	5	02	L4
		V/batarath	o maior acti	vition of an (		rdta			CO1	
2	d	(i) Storage N	le major acti 1anagemen	t (ii) Me	mory Manag	ement		5		
	b	What is V diagram.	'irtual Macl	nine? Expla	in VM-Ware	e architecti	ure with n	eat 5	CO1	L2
	С	What is a process? Draw and explain the following: (i) process state diagram (ii) Process Control Block(PCB)							CO2	L4
			<u>v</u>	МО	DULE-2					
3	а	What is Ir communica	nter-process ation with res	s communi	ication? Exp ssage passir	olain direct 19 system.	and indir	ect 6	CO2	L4
	b	What are th	e benefits c	f multi-threa	ading? Expla	in multithrea	ading mode	ls. 4	CO3	L4
	С	Explain criti	cal-section	problem an	d solution to	it	0	5	CO3	L4
				•	OR					
4	а	Explain the	different thr	eading issue	es in Multithr	eaded Prog	ramming	5	CO4	L4
	b	Following is	the snapsh	ot of a CPU				6	CO4	L4
		Process		Burst Time	<del>9</del>	Arrival Tir	ne			
		P1 5 0								
		P2 1 1								
		P3 4 2								
		Draw gran using FCFS,	me							
	С	Explain Syn	xplain Synchronization Hardware in detail.							L4

### b. Assignment -1

	Model Assignment Questions						
Crs Code:	Sem: Marks: Time:						
Course:							
SNo	Assignment Description	Marks	СО	Level			
1	What is an OS? List out the different services that an OS	5	CO1	L2			
	provides. Explain.						
2	Explain the layered approach to structuring of an OS along	7	CO1	L2			
	with a relevant diagram						
3	What are the major activities of an OS with regard to	6	CO1	L2			
	(I) Process management						
	(II) Memory management.		<u> </u>				
4	(i) N (V) OS and Distributed OS	0	CO1	L2			
	(ii) Web-Based Computing and Embedded						
	Computing.						
5	What is a process? Draw and explain the process state	5	CO2	L2			
J J	diagram	Ű					
6	Explain different scheduling criteria that must be kept in mind 6 CO2 L						
	while choosing different scheduling algorithms.						
7	What are virtual machines? Explain its advantages with a	8	CO2	L2			
	diagram.						
8	List and explain services provided by an OS that are designed	8	CO2	L2			
	to make using computer system more convenient for users.		00.				
9	What are system calls? With examples explain different	6 CO2 L4					
10	Categories of system calls.						
10	distributed OS						
11	What is a PCB? Explain with a neat diagram	5	CO2	14			
12	What is interprocess communication? Explain direct and	8	CO2				
	indirect communication with respect to message passing						
	system.						
13	Explain the differences between single-threaded and	8	CO3	L4			
	multithreaded processes using neat diagram.						
14	What are the benefits of multithreading? Explain the	8	CO3	L4			
	multithreading models						
15	Explain the different threading issues.	6	CO3	L4			
16	Define multithreading. Explain the benefits of multithreading.	7	<u>CO3</u>	L4			
17	List and explain the different scheduling criteria. Explain	7	CO4	L4			
10	priority scheduling with an example.		<u> </u>				
18	Explain critical-section problem and solution to it	6	<u> </u>	L4			
19	Explain Synchronization Hardware in detail.	6	<u> </u>	L4			
20	Explain Reduers-whilers problem and provide a semaphore solution using semaphores for roads priority problem	/	004	L4			
21	Explain Dining-Dhilosopher's problem using monitors	6	CO4	14			
21	Explain bining - microsopher's problem using monitors.	6	CO4				
	structure: write a monitor solution to bounded-buffer problem.	0	004	L4			

# D2. TEACHING PLAN - 2

### Module – 3

Title:	Deadlocks and Memory management	Appr	8 Hrs
		Time:	
Α	Course Outcomes	-	Blooms

Г

_	The student should be able to <sup>.</sup>	_	Level
1	Analyze various deadlock methods and memory management schemes	CO3	
2	Explain various, memory management schemes	CO3	12
		005	
b	Course Schedule		
Class No	Portion covered per hour	-	-
21	Deadlocks : Deadlocks; System model	CO3	L4
22	Deadlock characterization	CO3	L4
23	Methods for handling deadlocks	CO3	L4
24	Deadlock prevention: Deadlock avoidance	CO3	 L4
25	Deadlock detection and recovery from deadlock	CO3	 L4
26	Memory Management: Memory management strategies	CO3	L2
27	Background; Swapping	CO3	L2
28	Contiguous memory allocation	CO3	L2
29	Paging; Structure of page table	CO3	L2
30	Segmentation.	CO3	L2
С	Application Areas	-	-
-	Students should be able employ $\checkmark$ apply the Module learnings to	-	-
1	Image editing programs, and communication programs	CO3	L2
2	managed resources can be controlled using mutexes	CO3	L2
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
31	Explain necessary conditions for deadlock to occur.	CO3	L4
32	Explain resource-allocation graph algorithm with an example.	CO3	L4
33	Explain deadlock detection algorithms.	CO3	L4
34	Explain different methods to recover from deadlock.	CO3	L4
35	Dead lock exists if a cycle exists. Yes or no. Justify your answer with a suitable example.	CO3	L4
36	What are the methods used to handle the deadlocks? Explain how circular wait condition can be prevented from occurring.	CO3	L4
37	What is locality of reference? Differentiate between paging and segmentation.	CO3	L4
38	Why are translation loan-aside bubbles(TLB) important? In a simple paging system, what information is stored in TLB ? Explain.	CO3	L2
39	What is swapping? Does this increase the operating systems overhead? Justify your answers	CO3	L2
40	What do you mean by fragmentation? Explain difference between internal and	CO3	L2
	external fragmentation with neat diagrams.	001	
41	Explain basic method and nardware required for segmentation.	CO3	L2
42	Distinguish between:	CO3	L2
	ii) Paging versus segmentation		
	lii) First fit and best fit algorithms.		
43	Given memory partitions of 100K, 500K, 200K, 300K and 600K apply first fit and	CO3	L2
	uest in algorithm to place 212K, 41/K, 112K driu 420K. Evolain the structure of page table with respect to biotarchy paging	$CO_{2}$	1.2
44	Consider the following snapshot of a system:	$CO_3$	12
45	Consider the following shapshot of a system.	003	LZ
	Allocation MAX Available		
	Allocation MAX Availabt		
	e		
	ABCABCAB		
	Po   0 0 2   0 0 4   1 0		
	2		

	P1	1	0	0	2	0	1								
	P2	1	3		1	3	7								
		5													
	P3	6	3	2	8	4	2								
	P4	1 3	4		1	5	7								
46	Answells the s If a red immed	r the f ysten quest iately	follow n in a fron ?	ving sa n p	fe st roce	estio ate" ess F	pns u ? P2 a	ising rrive	Bai s fo	nker' or (0	's alç 02) (	orithm	n: e request be grante	d	
40		e give	11 51 10	apsi	IOL.									003	LZ
		Al	loca	tio	า		Μ	AX		A	vail	able			
		Α	N B D	С		Α	В	С	D	А	В	СD	_		
	P1	0 2	0	1		0	0	1	2	1 0	5	2			
	P2	1 0	0	0		1	7	5	0						
	P3	1 4	3	5		2	3	5	6						
	P4	0 2	6	3	2	0	6	5							
	P5	0 4	0	1	6	0	6	5							
	Using I) Wha II) Is the III) If a r	Banke t is ne e syste eque	er' alq ed n em ir st fro	gorii natr n sai m p	thm: ix cc fe st proce	onter ate? ess f	nt? rom	P2(0	),4,2	,0) a	rrive	rs, can	it be granted?		
е	Experie	ences	;										~	-	-
1														CO6	L2
2															

## Module – 4

Title:	User Defined Functions and Recursion	Appr	8 Hrs
		Time:	
Α	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Interpret various paging techniques	CO4	L3
2	Understand organization of files and directories.	CO4	L2
b	Course Schedule		
Class No	Portion covered per hour	-	-
31	Virtual Memory Management: Background	CO4	L3
32	Demand paging; Copy-on-write; Page replacement; Allocation of frames	CO4	L3
33	Thrashing	CO4	L3
34	File System;Implementation of File System: File system: File concept; Access	CO4	L2
	methods;Directory structure File system mounting		
35	File sharing;Protection:Implementing File system: File system structure; File	CO4	L2
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	system implementation		
36	Director implementation	CO4	L2
37	Allocation methods; Free space management	CO4	L2
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	To develop operating system	CO4	L3
2	To create computer applications	CO4	L2
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
47	What is page fault ? With a supporting diagram explain the steps involved in	CO4	L3
	handling page fault.		
48	Consider the following page reference stream 7,0,1,2,0,3,0,4,2,3,0. Calculate the	CO4	L3
	number of page faults when number of frames is equal to 3, using FIFO, LRU		
	and Optimal page replacement algorithms.		-
49	Explain the different LRU-approximation page replacement algorithms.	CO4	L3
50	Explain copy-on-write process in virtual memory.	CO4	L3
51	Write short note on thrashing.	CO4	L3
52	What are the different allocation methods in disk? Explain in detail any two	CO7	L3
	methods.		
53	What are different types of file sharing? Explain.	CO4	L2
54	List the different Directory Structure. Explain acyclic-graph directory and tree	CO4	L2
	structured directory.	00	1 -
55	Explain different free space management	CO4	L2
56	What is a file? Also list different file operations	<u>CO4</u>	L2
57	Explain different free space management	CO4	L2
58	What are the different techniques with which a file can be shared among users.	<u>CO4</u>	L2
59	Explain various file protection mechanisms.	CO4	L2
60	Explain briefly different file systems and file attributes.	CO4	L2
~	Experiences		
4 1	Experiences	-	-
		$CO_7$	12

# E2. CIA EXAM – 2

### a. Model Question Paper - 2

Crs Code	e:	Sem:	Marks:		Time			
Cour	se:							
-	-	Note: Answer all quest	ıle : 3, 4	Marks	CO	Level		
1	а	What are the method circular wait condition c	s used to handle the an be prevented from o	deadlocks? ccurring.	? Explain how	/ 7	C07	L2
	b	Explain different metho	ds to recover from dead	lock.		8	CO7	L2
			OR					
2	а	Why are translation lopaging system, what inf	? In a simple	6	CO8	L2		
	b	What is swapping? Doe Justify your answers	es this increase the ope	erating syste	ms overhead?	5	CO8	L2
	С	What do you mean by f and external fragmenta	ragmentation? Explain c tion with neat diagrams.	lifference be	tween interna	4	CO8	L2
			MODULE-4					
3	а	What is page fault ? Wil in handling page fault.	h a supporting diagram	explain the	steps involvec	8	COg	L3
	b	Consider the followir Calculate the number o using FIFO, LRU and Op	ng page reference s f page faults when num stimal page replacemen	tream 7,0,1 ber of frame t algorithms.	1,2,0,3,0,4,2,3,0 es is equal to 3	, 7	CO9	L3

		OR			
4	а	What are the different techniques with which a file can be shared among	8	CO10	L3
		users.			
	b	Explain briefly different file systems and file attributes.	7	CO10	L3

### b. Assignment – 2

					Мс	bdel	Assi	gnm	ent	Quest	ions			
Crs Code:		Sem:					Ma	rks:			Time:			
Course:														
SN	0				A	ssig	nme	ent D	esc	riptio	n	Marks	со	Level
1		What a	are th	e me	etho	ds u	sed	to h	andl	e the	deadlocks? Expla	ain 6	CO3	L2
2		What	is loc	ality	of	refe	renc	:e? [	Diffe	rentia	te between pagi	ng 7	CO3	L2
3		Why a simple Explair	re tra pagi n.	ing s	tion syste	loai em,	n-as wha	ide l at inf	oubt form	oles(T ation	LB) important? Ir is stored in TLB	a 8 ?	CO3	L2
4		What i overhe	s swa ad? J	ns 6	CO3	L2								
5		What betwee diagrai	do y en ir ms.	ce 6 eat	CO3	L2								
6		Explair segme	n ba entatio	asic on.	m	ethc	bd	and	h	ardwa	are required t	for 7	CO3	L2
7		Distinguish between: I) Logical versus physical address space ii) Paging versus segmentation. Iii) First fit and best fit algorithms											CO3	L2
8		Consid	ler the	e foll	.owii	ng si	naps	shot	ofa	syster	m:	6	CO3	L2
			Allo	cati	on	MA	X		Ava e	ailab	l			
			A	В	С	A	В	С	A C	В				
		Po	0	0	2	0	0	4	1 2	0				
		P1	1	0	0	2	0	1						
		P2	1 5	3		1	3	7						
		P3	6	3	2	8	4	2						
		P4 1 4 1 5 7 3												
		Answer the following questions using Banker's algorithm: Is the system in a "safe state" ? If a request from process P2 arrives for (002) can the reque be granted immediately?												
9		For the given snapshot:									6	CO3	L2	
			Al	loca	atio	n		Μ	AX		Available			
170564											Copyright ©2017. cAA	45. All rights	reserved	

		A	B D	С	A	В	С	D	A	В	С	D			
	P1	0 2	0	1	0	0	1	2	1 0	5	2	2			
	P2	1 0	0	0	1	7	5	0							
	P3	1 4	3	5	2	3	5	56							
	P4	0 2	6	3	0 2	6	5								
	P5	0 4	0	1	0 6	6	5								
	Using E I) What II) Is the III) If a re granted	Banke is nee syste eques I?	r' alg ed m em in st fro	gorithr natrix o n safe om pro	n: conte state? ocess	nt? fron	n P2	2(0,4,	2,0)	arriv	ers,	can it be			
10	What is steps in	s page volve	e fau d in	ult ? V handli	With a ing pa	a su age f	ppo fault	rting	dia	gran	n ex	plain the	6	CO3	L2
11	Conside 7,0,1,2,0 number page re	er 1 ,3,0,4, r of fra place	the 2,3,0 ame mer	foll D. Calc s is eq nt algo	owing culate qual t prithm	) the 0 3, 15.	pag nur usir	je nbei ig Fl	refe r of   FO,	eren page LRU	ce e fau anc	stream Ilts when I Optimal	7	CO3	L2
12	Explain algorith	the ms.	diffe	rent l	_RU-a	appro	oxin	natio	n pa	age	rep	lacement	7	CO3	L2
13	Explain	copy-	-on-	write p	oroce	ss in	ı virt	ual r	nem	ory.			6	CO4	L2
14	Write s	hort n	ote	on thr	ashin	g.				,			6	CO4	L2
15	What a detail a	are the	e dif c me	ferent ethods	alloc	atio	n m	etho	ds i	n dis	sk? E	Explain in	6	CO4	L2
16	What ar	re diffe	eren	t type	s of fi	le sh	narin	Ig? E	xpla	in.			6	CO4	L3
17	List the director	e diffe y and	erent tree	t Dire	ctory tured:	Stru dire	uctu ecto	re. E ry.	Expla	ain a	асус	lic-graph	7	CO4	L3
18	Explain	differe	ent f	ree sp	bace r	nana	ager	nent	t				7	CO4	L3
19	What is	a file?	? Als	o list o	differe	ent fi	le o	pera	tions	5			6	CO4	L3
20	Explain	differe	ent f	ree sp	bace r	nana	ager	nent	t				7	CO4	L3
21	What a shared	re the amon	ə dif g us	ferent ers.	tech	niqu	les	with	wh	ich a	a file	e can be	8	CO4	L3

# D3. TEACHING PLAN - 3

## Module – 5

Title:	Secondary Storage Structures, Protection	Appr	8 Hrs							
		Time:								
Α	Course Outcomes									
-	The student should be able to:	-	Level							
1	Interpret different methods of secondary storage									
2	Show the Design principles of OS w.r.t Linux OS	CO5	L3							
b	Course Schedule									
Class No	Portion covered per hour	-	-							
.38	Secondary Storage Structures, Protection: Mass storage structures; Disk	CO5	L3							

	structure: Disk attachment: Disk scheduling		
39	Disk management; Swap space management. Protection: Goals of protection, Principles of protection	CO5	L3
40	Domain of protection, Access matrix, Implementation of access matrix, Access control	CO5	L3
41	Revocation of access rights. Capability- Based systems	CO5	L3
42	Case Study: The Linux Operating System: Linux history: Design principles:	CO5	 L3
	Kernel modules	000	-5
43	Process management; Scheduling; Memory Management;	CO5	L3
44	File systems	CO5	L3
45	Input and output;Inter-process communication	CO5	L3
	Application Areas		
C	Application Areas Students should be able employ ( apply the Medule learnings to	-	-
-	Students should be able employ 7 apply the Module learnings to	-	-
2	Companies , nospital To build embedded software	CO5	<u> </u>
۷		005	∟്
d	Review Questions	_	_
-	The attainment of the module learning assessed through following questions	-	_
61	List the different disk scheduling techniques Explain any two	COS	13
01	scheduling,considering the following disk queue requests: 98,183,37,122,14,124,65,67.	005	L)
62	What is an access matrix? Explain the different methods of implementing access matrix.	CO5	L3
63	Explain bad-block recovery in disk.	CO5	L3
64	Explain the different steps involved in disk formatting	CO5	L3
65	Suppose that a disk has 50 cylinders named 0 to 49. The read/write head is currently serving at cylinder 15. The queue of pending requests are in order: 4, 40,11, 35, 7,14.For each of the scheduling algorithms: SCAN, C-LOOK and C- SCAN. i) Show the graphical representation for above scheduling algorithms.(ii) Find the average head movement for above scheduling algorithms	CO5	L3
66	Differentiate between protection and security.	CO5	L3
67	Explain the various storage mechanisms available to store files with neat diagram.	CO5	L3
68	Write a short notes on:	CO5	L3
	I) Swap space management		
60	III REVOLUTION OF decess NYMEs	<u> </u>	
69	disk space	005	∟3
70	Explain the following disk scheduling algorithm in brief	COF	10
70	I) SSTF ii) SCAN iii) LOOK	005	<b>∟</b> 3
71	Explain in brief the selection of disk scheduling algorithm	COs	२
72	Explain the Design principle of Linux	COF	2   2
73	Explain the process management in Linux platform.	COS	 2
7 <u>/</u>	Explain the interprocess communication mechanism in Linux	COS	<u> </u>
75	Explain File Systems in Linux.	COS	 2
76	What do you mean by Cloning? How is it achieved in Linux system	CO5	 
77	Write a short notes on:	CO5	L٦
,,	I) Portability issues in LINUX		_5
	ii) Network structure in LINUX.		
е	Experiences	-	-
1		CO10	L2
2		COg	

# E3. CIA EXAM – 3

### a. Model Question Paper - 3

Crs C	Code	Sem:	Marks:	Time:			
Cour	rse:						
-	-	Note: Answer all quest	ions, each carry equal r	narks. Module : 5	Marks	СО	Level
1	а	What is an access matr access matrix.	ix? Explain the different	methods of implementir	ng 6	CO5	L3
	b	Explain bad-block reco <sup>,</sup>	7	CO5	L3		
			OR				
2	а	List the different c scheduling,considering 98,183,37,122,14,124,65,6	lisk scheduling tech the following 07.	niques,Explain any tv disk queue reques	vo 7 ts:	CO5	L3
	b	Explain the interproces	s communication mech	anism in Linux.	8	CO5	L3
			MODULE-5				
3	а	Explain the various stor diagram.	age mechanisms availa	ble to store files with ne	at 7	CO5	L3
	b	Write a short notes on: I) Swap space manager ii) Revocation of access	nent rights		8	CO5	L3
			OR				
4	а	With supporting diag allocating disk space.	rams, explain linked	and indexed method	of 8	CO5	L3
	b	Explain the following di I) SSTF ii) SCAN iii) LC	sk scheduling algorithm )OK	in brief:	7	CO5	L3

### b. Assignment – 3

	Mode	l Assignment (	Questions				
Crs Code:	Sem:	Marks:		Time:			
Course:							
SNo	Assignme		Marks	со	Level		
1	What is an access matrix? implementing access matrix.	Explain the	different	methods of	5	CO5	L3
2	Explain bad-block recovery in dis	sk.			6	CO5	L3
3	Explain the different steps involve	ed in disk form	atting		7	CO5	L3
4	Suppose that a disk has 50 cyli head is currently serving at cylin are in order: 4, 40,11, 35, 7,14.Fc SCAN, C-LOOK and C-SCAN. i) above scheduling algorithms.(ii) above scheduling algorithms	nders named der 15. The qu or each of the Show the gra Find the aver	0 to 49. Th eue of pen- e schedulin phical repre age head r	ne read/write ding requests g algorithms: esentation for novement for	6	CO5	L3
5	Differentiate between protection	and security.			4	CO5	L3
6	Explain the various storage me neat diagram.	chanisms ava	ilable to st	ore files with	5	CO5	L3
7	Write a short notes on: I) Swap space management ii) Revocation of access rights				7	CO5	L3
8	With supporting diagrams, exp allocating disk space.	olain linked a	nd indexed	d method of	7	CO5	L3
9	Explain the following disk schedu I) SSTF ii) SCAN iii) LOOK	uling algorithm	n in brief:		6	CO5	L3
10	Explain in brief the selection of d	sk scheduling	algorithm.		5	CO5	L3
11	Explain the Design principle of L	inux.	-		7	CO5	L3
12	Explain the process managemer	nt in Linux plat	form.		6	CO5	L3

13	Explain File Systems in Linux.	5	CO5	L3
14	What do you mean by Cloning? How is it achieved in Linux system.	7	CO5	L3
15	Write a short notes on:		CO5	L3
	I) Portability issues in LINUX			
	ii) Network structure in LINUX.			

# F. EXAM PREPARATION

# 1. University Model Question Paper

Course:		Sensors	and Trar	nsducers			_	Month /	′ Year	May /2	2018
Crs C	ode:	15EE66	52 S	em:	6	Marks:	80	Time:		180 mi	nutes
Mod		Answer	all FIVE f	ull questi	ons. All qu	estions carry equ	ial marks.		Marks	СО	Level
ule											
1	а	Define (	06	CO1	L2						
	h	Evolain	the sory	$\frac{1}{1000}$	norating	System that are h	alpful for i	icotr and	06	CO1	12
	D	the syst									
	С	Define t	he follow	ving terms					04	CO1	L2
		I) virtual	machine	es							
		ii) CPU s	schedule	r							
		iii) Syste	em call								
		iv) Cont	ext switcl	1							
					(	OR					
	а	What is	a proces	s? Draw a	nd explair	n the process state	e diagram		05	CO2	L4
	b	What i	is interp	rocess c	ommunic	ation? Explain (	direct and	indirect	06	CO2	L4
		commu	nication	with respe	ect to mes	sage passing syst	tem.				
	С	Explain	the layer	ed approa	ach to stru	icturing of an OS a	along with a	relevant	09	CO2	L4
		diagram	1								
										-	
2	а	Explain Progran	Multithre nming.	eading m	odels, Als	so list the benefi	its of Multi	threaded	06	C03	L2
	b	Explain	Multipro	cessor Sch	neduling				04	C03	L2
	С	Consid	er the fol	lowing se	t of proce	sses with arrival t	ime:		06	CO3	L2
		Proc	Burst	Arrival	priority						
			Time	time	101101109						
		000	/m	/m							
			(111	(111							
			sec)	sec)		-					
		P1	10	0	4	-					
		P2	5	3	2						
		P3	6	3	6						
		P4	4	5	3						
		Conside	er larger r	number as	s highest	priority. Calculate	the average	e waiting			
		time ar	nd turn	around t	time and	draw Gantt ch	hart for pre	eemptive			
		schedu	ling and p	premptive	SJF sche	duling.					
		OR									
	а	What ar solution	re the req 1 to critica	uirements al section i	s to critica problem.	l section problem	1? Explain Pe	eterson's	06	CO4	L3
	b	Explain	Dining-p	hilosophe	rs probler	n with semaphore	es.		05	CO4	L3
	С	Explain	the synta	ax and sch	iematic vie	ew of monitors			05	CO4	L3
			,								
3	а	What a method	are the Is to reco	necessary ver from c	/ conditio leadlock.	ons for deadlock	k? Explain	different	08	CO5	L4
·											

	b	Consic	ler the	e foll	.owii	ng sr	naps	hot	of a s	ystem:			08	CO5	L4
		Allocation M					Х		Ava e	ilabl					
			A	В	С	А	В	С	A C	В					
		Po	0	0	2	0	0	4	1 2	0					
		P1	1	0	0	2	0	1							
		P2	1 5	3		1	3	7			-				
		P3	6	3	2	8	4	2			-				
		P4	1 3	4		1	5	7							
		Answe Is the s If a rec immed	r the syster quest diately	follo n in fron /?	wing a "sa n pro	g que afe st ocess	estio ate" s P2	ns u ? arriv	ves fo	Banker or (002	's algorithm: ) can the request be grant	ed			
									OF	2					
	а	What buffer.	is pa	ging	? E:	xplai	n pa	agin	g ha	rdware	with translation look-asi	de	06	CO6	L2
	b	Explair	<u>the</u> :	struc	cture	e of p	age	tabl	le wit	h respe	ect to hierarchical paging.		06	CO6	L2
	С	Given the 5 memory partitions of 100K, 500K, 200K, 300K and 600K apply first fit and best fit and worst fit algorithm to place 212K, 417K, 112K and 426K size. Which algorithm makes efficient use of memory?											04	CO6	L2
4	а	What is page fault ? With a supporting diagram explain the steps involved in handling page fault.										əd	06	CO7	L3
	b	Consider the following page reference stream 7,0,1,2,0,3,0,4,2,3,0. Calculate the number of page faults when number of frames is equal to 3, using FIFO. I RU and Optimal page replacement algorithms											06	CO7	L3
	С	Explain copy-on-write process in virtual memory.											04	C07	L3
						-			OF	2					
	а	What two m	are t <u>etho</u> c	ne c ls	utter	ent a	alloc	atio	n me	thods	in disk? Explain in detail a	ny	06	CO8	L2
	b	What is a file? Also list different file operations.											03	CO8	L2
	С	List the tree st	e diffe ructui	erent red c	t Dir direc	ectoı tory.	ry St	truct	ure.	Explair	acyclic-graph directory a	nd	07	CO8	L2
5	a	List t schedu 98,183	he uling, ,37,12	diffe cons 2,14,:	rent ider 124,6	dis ing 65,67	sk th	sche e	edulii follc	ng te wing	chniques,Explain any tv disk queue reques	vo ts:	06	CO9	L3
	b	What i access	s an a s matr	acce ix.	ss m	natrix	:? Ex	plai	n the	differe	ent methods of implementi	ng	06	CO9	L3
	С	Explair	1 bad	-blo	ck re	ecove	ery ir	n dis	ik.				04	CO9	L3
	~	Evolair	n tha	Doc	ian -	orina	inla	of	OF	(			06	CO10	
	d h	Explain	the	Des	IYN ( Dec	man	ihre	UI LI mor	nt in I	inuv n	latform		00	CO10	   າ
	C	Explair	the	inte	rpro	cess	con	nmu	nicati	ion me	chanism in Linux.		04	CO10	<u>L</u> 3

# 2. SEE Important Questions

Course:			Month /								
Crs C	ode:	1	S	em:		Marks:		Time:			
	Note	Answer	all FIVE f	ull questio	ons. All qu	estions carry equa	l marks.		-	_	
Mod ule	Qno.	Importa	nt Questi	on					Marks	со	Year
1	1	Define ( operatir	Operating	g System. n.	With a ne	eat diagram explair	n the dual m	ode of	06	CO1	2018
	2	Explain the svst	the serv em.	etr and	06	CO1	2018				
	3	Define t	he follow		04	CO1	2018				
		i) virtual ii) CPU s iii) Syste	machine schedulei em call								
		iv) Cont	ext switcl	า							
	4	What is	a proces	s? Draw a	nd explair	the process state	diagram		05	CO2	2018
	5	What i commu	s interp nication \	rocess c with respe	ommunica ct to mes	ation? Explain di sage passing syste	irect and i em.	ndirect	06	CO2	2018
	6	Explain diagram	the layer า	ed approa	ich to stru	cturing of an OS al	ong with a re	elevant	09	CO2	2018
	7	What ar	re essenti	al propert	ies of bato	ch,real time and dis	stributed OS		06	CO1	2014
	8	What ar	e the diff	erent way	s in which	P-threads termina	ite		05	CO1	2015
	9	Differnti	ate betw	een multip	programm	ing and multiproce	essing.		05	CO1	2015
	10	What a system	re systei calls	n calls?	With exai	mple explain diffe	erent catego	ries of	07	CO2	2012
	11	What ar	e virtual ı	machines	? Explain i	ts advantages with	a neat diagr	am	08	CO2	2014
	12	What ar and indi	re the bei irect inter	process offer	red by co- communic	operating process ation.	es? Describe	e direct	07	CO2	2012
2	1	Explain Multithreading models, Also list the benefits of Multithreade								C03	2018
		Progran	nming.							<u> </u>	0010
	2	Explain	Multiproc	cessor Scr	t of proce	coocyvith arrival tin			04	<u> </u>	2018
	3	Consid		lowing se		 	ne.		00	03	2017
		Proc	Burst	Arrival	priority						
		ess	lime	time							
			(m	(m							
			sec)	sec)							
		P1 D2	10 5	0	4						
		P3	5 6	<u>з</u>	6						
		P4	4	5	3						
		Conside	er larger r	number as	s highest i	, priority. Calculate t	he average v	waiting			
		time aı	nd turn	around t	ime and	draw Gantt cha	art for pree	mptive			
		schedu	ling and p	premptive	SJF schee	duling.					
	4	Explain Control synchronization and need for control synchronization wit an example								CO3	2018
	5	Define r	nultithrea	ading. Exp	lain the be	enefits of multithrea	ading.		7	CO3	2016
	6	List an <u>sche</u> dul	d expla ling with a	in the d an examp	lifferent s le.	scheduling criteria	a. Explain	priority	7	CO4	2015
	7	Explain	critical-se	ection pro	blem and	solution to it			6	CO4	2017
	8	What ar solution	e the req to critica	uirements al section p	s to critica problem.	l section problem?	Explain Pete	erson's	06	CO4	2017
	9	Explain	Dining-p	hilosophe	rs probler	n with semaphores	5.		05	CO4	2016
	10	Explain	the synta	ix and sch	ematic vie	ew of monitors			05	CO4	2016
3	1	What a	are the	necessary	/ conditic	ons for deadlock?	? Explain d	ifferent	08	CO5	2018
17CS62	1					Со	ovriant ©2017. (	CAAS, All	rights res	served.	

		metho	ds to	reco	ver	from	dea	adloo	ck.					
	2	Consider the following snapshot of a system:									07	CO5	2018	
			Allc	cati	on	MA	Х		Ava	ilabl				
									е					
			٨	D	C	Λ	D	C	^	D	-			
			A	D	C	А	D	C		D				
									C		-			
		Po	0	0	2	0	0	4	1	0				
									2		-			
		P1	1	0	0	2	0	1			_			
		P2	1 5	3		1	3	7						
		P3	6	3	2	8	4	2			-			
		P <sub>4</sub>	1	1		1	Б	7			-			
		4	3	7		-	5	/						
		Answe	er the	follo	wing	g que	estic	ons u	ising	Banker	's algorithm:			
		Is the s	syster	n in a	a "sa	ife st	ate"	?						
		in a rec	quest diately	Tron	n pro	ces	5 P2	arri	ves to	or (002	) can the request be granted	ג		
	3	What	are	, . the	nec	essa	rv	cond	dition	s for	deadlock? Explain differer	t 08	CO5	2017
		metho	ds to	reco	ver	from	dea	adloo	ck.					
	4	What is swapping? Does this increase the operating systems overhead?									? 08	CO5	2016	
	5	What do you mean by fragmentation? Explain difference between internal									l 08	CO5	2015	
	0	and external fragmentation with neat diagrams.								<u> </u>				
	6	Explain basic method and hardware required for segmentation.									CO6	2017		
	/	I) Logical versus physical address space										000	2010	
		ii) Paging versus segmentation.												
		lii) First fit and best fit algorithms.												
	8	Given the 5 memory partitions of 100K, 500K, 200K, 300K and 600K apply first fit and best fit and worst fit algorithm to place 212K, 417K, 112K and 426K size. Which algorithm makes efficient use of memory?								00 \ k	CO6	2015		
4	1	Explair	n the	diffe	rent	LRU	-app	oroxi	matio	on pag	e replacement algorithms.	06	CO7	2016
	2	what i in hand	s pag dlina I	e tai bade	ut ? e fau	with lt.	ı a s	uppo	orting	g diagra	am explain the steps involved	00 k	07	2017
	3	Consic	ler t	he	follo	wing	g p	age	refe	erence	stream 7,0,1,2,0,3,0,4,2,3,0	. 06	CO7	2016
		Calcul	ate th	e nu	mbe	er of	pag	e fai	ults w	/hen nu	umber of frames is equal to g			
	4	USING H	-IFO,		and		imal	pag	le rep	almor	ent algorithms.		C07	2010
	4 5	_⊏xµialr X/hat	are t	he d	-wii liffer	ent a	allor	ss III catio	n me	at men thods	in disk? Explain in detail an	04	007	2010
	J	two methods.									'  00			
	6	What is a file? Also list different file operations.									05	CO8	2018	
	7	List the	e diffe	erent	t Dir Iirec	ecto	ry S	truc	ture.	Explair	acyclic-graph directory and	d 07	CO8	2017
	8	Consic	ler t	he	follo	wind	a n	ade	refe	erence	stream 7.0.1.2.0.3.0.4.2.3.0	0, 08	C08	2017
	Ū	Calcul	ate th	e nu	mbe	er of	pag	e fai	ults w	/hen ni	umber of frames is equal to 3			
		using F	FIFO,	LRU	and	Opt	imal	pag	le rep	lacem	ent algorithms.	<u> </u>		
					1							<u> </u>		
5	1	Write a	a shor	t not	tes c	n: nom	ont					08	COg	2017
		ii) Revo	o space ocatio	n of	and	əss ri	ght	5						
	2	With	suppo	orting	g_d	iagra	a <u>m</u> s,	ex	plain	linked	d and indexed method c	f 08	CO9	2016

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-					
		allocating disk space.			
	3	Explain the following disk scheduling algorithm in brief:	08	CO9	2015
		I) SSTF ii) SCAN iii) LOOK			
	4	Explain in brief the selection of disk scheduling algorithm.	08	CO9	2018
	5	Explain the Design principle of Linux.	08	CO10	2017
	6	Explain the process management in Linux platform.	05	CO10	2015
	7	Explain the interprocess communication mechanism in Linux.	07	CO10	2016
	8	List the different disk scheduling techniques, Explain any two	08	CO10	2018
		scheduling, considering the following disk queue requests:			
		98,183,37,122,14,124,65,67.			
	9	What is an access matrix? Explain the different methods of implementing	08	CO10	2018
		access matrix.			
	10	Explain bad-block recovery in disk.	08	CO10	2018