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## Thapar Institute of Engineering & Technology, Patiala Department of Computer Science & Engineering Operating Systems (UCS303): Auxiliary Exam

Faculty Name: Garima Singh

Date & Time: 24/08/2024 at 5:30pm

Maximum Marks: 100

Maximum Time: 3 Hrs

Note: Attempt all questions and each sub-part like (a), (b), (c) for each question at one place. Do mention Page No. of your attempt at front page of the answer sheet. Assume missing data (if any). Show all intermediate computations properly

1.	a)	Discuss the key functionalities	s of an Operating Syst	tem (OS) and expla	in how each function	5		
		contributes to the overall efficien	ncy and user experience	of a computer system	L.			
	b)	Compare monolithic kernels an	d microkernels in terms	of architecture, perf	formance, security, and	5		
		real-world applications. What ar	e the trade-offs of each a	approach?				
	c)	Why are system calls essential	l in an operating system	m? What will be th	e output of following	10		
		program?						
		int main() {						
		fork();						
1		fork() && fork()    fork	();					
		fork();						
		printf("Auxiliary exam	n");					
		return 0; }						
2	a)	Describe the critical section pr	roblem and its significa	nce in concurrent p	rogramming. How can	5		
		semaphores be used to solve this		_				
	b)							
la	- /	and V(S) increments S. During an execution, 7 P(S) operations and 10 V(S) operations are issued in						
		some order. What will be the fin						
	c)	Consider the four main sections		text section data se	ection, hean, and stack	5		
	٠,							
		Identify and explain which section is used for each of the following types of information: global variables, static variables, dynamic memory allocation, function call, and local variable storage.						
	d)	There are six processes named	14					
1	u)	given below. The time quantum				8		
		Find out average waiting time at			to using KK argorithm.	0		
		Process ID	Arrival Time	Burst Time	٦			
		1	0	5	-			
		2	1	6				
		3	2	3				
		4	3	1				
		5	4	5				
		6	6	4				

3	a)	How does the operating syst	em manag	ge prog	rams t	hat do	not fit	entirely	into ph	ysical m	emory?	
	b)	Differentiate between pagin	g and seg	mentati	ion tec	hnique	es. Cor	isider a	single l	evel pag	ging scher	ne.
		The virtual address space is	4 MB ar	nd page	size i	s 4 K	B. Wh	at is the	maxim	um pag	e table en	try
		size possible such that the er	ntire page	table fi	ts well	in one	e page'	)				
	c)	Explain Belady's Anomaly	. A syste	em use	s 3 p	age fr	ames	for sto	ing pro	cess pag	ges in m	ain
		memory. It uses the First	in First	out (F	FIFO)	page	replace	ement	policy.	Conside	r the Pa	ges
		referenced by the CPU in th	ie order ai	re 6, 7,	8, 9, 6	, 7, 1,	6, 7, 8	8, 9, 1.	Weather	the algo	orithm su	fer
		with Belady's anomaly or no	ot for the	given re	eferenc	e strin	g if ye	s then o	emonstr	ate.		
	d)	Calculate the hit ratio and r	niss ratio	for the	e refer	ence st	tring g	iven in	previou	s questi	on using	the
		following schemes?										
		i) LRU			ii)	Optima	al Page	Repla	ement			
	a)	Consider a system with three	ee types o	f resou	rces (1	R1, R2	, and	R3) and	four pr	ocesses	(P1, P2,	P3,
		and P4). The current state of	f the syste	em is re	epreser	nted by	the fo	llowin	Resour	ce Allo	cation Gra	iph
		(RAG): P1 is holding 1 unit	of R1 an	d is req	uestin	g 1 uni	it of R	2, P2 is	holding	2 units	of R2 and	d is
		requesting 1 unit of R3, P3 i	s holding	1 unit o	of R3 a	and is a	request	ing 1 u	nit of R	and P4	is holdin	g l
		unit of R1 and 1 unit of R3	3. Draw t	he Reso	ource .	Alloca	tion G	raph (F	AG) for	the giv	en scena	rio.
		Determine if there is a deadl	ock.									
	b)	Let there are 5 processes P1	l, P2, P3,	P4, P5	, and 3	3 types	of res	ources	X, Y, Z	. Total r	resources	are
.1			19 0	54		and the state of t			4 14		22.01	
		X=7, $Y=5$ , $Z=7$ . If state of	the syster	n is pre	esentec	by th	e table	given	below,	find out	system is	ir
		X=7, Y=5, Z=7. If state of safe state or not. If it is in sa	170					-				ir
			fe state, th		l out sa	afe seq		using E				in
		safe state or not. If it is in sa	fe state, th	nen find	l out sa	afe seq	uence	using E				in
		safe state or not. If it is in sa	fe state, th	nen find	l out sa	afe seq	uence	using E				in
		safe state or not. If it is in sa	fe state, the	nen find Iaximu Need	d out sa	Al	uence llocation	using E				in
		safe state or not. If it is in sa	fe state, the	nen find Iaximu Need	d out sa	Al	uence llocation	using E				in in
		safe state or not. If it is in sa	fe state, the state of the stat	nen find Iaximu Need Y	d out sa	Al X	llocation Y Z	on E				im; im
		safe state or not. If it is in sa  Proce s	fe state, the state, the X	Need Y	m Z	Al X	Y Z 0	using E				in in
		safe state or not. If it is in sa  Proces  8  P1  P2	fe state, thes M	Need Y 5	Z  3	All X	Y Z 0 1	using E				in
		Process Process P1 P2 P3	fe state, thes M	Need Y 5 2 1	Z 3 1 2	All X 1 3 0	Y Z 0 1	2 0				in
	c)	Proces  Proces  Proces  P1  P2  P3  P4	6 X X 6 4 5 1 5	Need Y 5 2 1 0 2	Z  3 1 2 2 3	X  1 3 0 1	Y Z 0 1 1 0 0 0	2 0 1 1 2	anker's	algorith	m.	
	c) a)	Process Process Pl P1 P2 P3 P4 P5	fe state, thes M	Need Y 5 2 1 0 2 ndatory	Z  3 1 2 2 3 condit	X  1 3 0 1 ions fo	Y Z 0 1 0 or the c	2 0 1 1 2 cccurrent	anker's	algorith	n system.	
		Proces  Proces  Pl  P2  P3  P4  P5  Define deadlock. Explain all	fe state, the State of Market No. 1	Need Y 5 2 1 0 2 indatory	Z  3 1 2 3 condit	X  1 3 0 1 ions fo	Y Z 0 1 0 or the coepended	2 0 1 1 2 cccurrent	anker's	algorith	n system.	
		Proces  8  P1  P2  P3  P4  P5  Define deadlock. Explain all  Explain significance of RA	fe state, the s M  X  6  4  5  1  four man ID (Redu eir advant)	Need Y 5 2 1 0 2 datory ndant / tages ar	Z  3 1 2 3 condit Array	X  1 3 0 1 ions for Indexed advanta	Y Z 0 1 0 or the coependences?	2 0 1 2 ccurrer	anker's	adlock i	n system.	ain
	a)	Proces  S  Proces  Proces  P1  P2  P3  P4  P5  Define deadlock. Explain all  Explain significance of RA  various RAID levels with the	fe state, the s M  X  6  4  5  I four man  ID (Reduction advantum sks (0-199))	Need Y 5 2 1 0 2 ndatory ndant Atages ar	Z  3 1 2 3 condit Array and disa	X  1 3 0 1 ions for of Indidunta sequential	Y Z 0 1 0 or the coepended ages?	2 0 1 1 2 occurrent Disloas follo	anker's acce of decs) in a	adlock i system,	n system. and expl	ain
	a)	Proces  8  P1  P2  P3  P4  P5  Define deadlock. Explain all  Explain significance of RA various RAID levels with the Suppose a disk has 200 track	fe state, the state, t	Need Y  5 2 1 0 2 Indatory Indant Atages are	Z  3 1 2 3 condit Array and disa	X  1 3 0 1 ions for of Indidunta sequential	Y Z 0 1 0 or the coepended ages?	2 0 1 1 2 occurrent Disloas follo	anker's acce of decs) in a	adlock i system,	n system. and expl	ain
	a)	Proces  S  Proces  Proces  Proces  P1  P2  P3  P4  P5  Define deadlock. Explain all  Explain significance of RA  various RAID levels with the Suppose a disk has 200 track  190 and the head position is	fe state, the s M  X  6  4  5  I four man  ID (Reduce ir advantation of the state) of total seel	Need Y  5 2 1 0 2 Indatory Indant Atages are  O. The reliand out the time.	Z  3 1 2 3 condit Array and disasequest which	X  1 3 0 1 ions for of Indiduntate sequences	Y Z 0 1 0 or the or epender ages? nce is a fulling a	2 0 1 1 2 occurrent Disloas follo	anker's  ace of de  as) in a  ws: 82,  m (SST)	adlock i system, 170, 43, F, SCAN	n system. and expl	ain 16
	a) b)	Proces  S  Proces  Proces  Proces  P1  P2  P3  P4  P5  Define deadlock. Explain all  Explain significance of RA various RAID levels with the Suppose a disk has 200 track  190 and the head position is will perform best in terms of	fe state, the s M  X  6  4  5  I four man  ID (Reduce ir advantates (0-199) s at 50. Fif total seed ocation m	Need Y  5 2 1 0 2 datory ndant Atages are before the find out the time.	Z  3 1 2 3 condit Array ad disasequest which	X  1 3 0 1 1 ions for Indiduntal sequel sched	Y Z 0 1 0 or the coepender ages? nce is a fulling a	2 0 1 2 occurrerent Disloas folloalgorith	anker's  acce of decis) in a  ws: 82, m (SST)	adlock i system, 170, 43, F, SCAM	n system. and expl 140, 24, N, C-LOC	ain 16. OK)