PES University, Bengaluru
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UE18CS302

DECEMBER 2020: END SEMESTER ASSESSMENT (ESA) B TECH 5 SEMESTER

UE18CS302 – Operating Systems - 4 credits

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	(i) Describe the difference between symmetric and asymmetric multiprocessing. (ii) What are three advantages and one disadvantage of multiprocessor systems?	6 (2+4)
	b)	Explain the types of Process Schedulers.	6
	c)	The processes P1, P2, P3, P4 enter the system in the sequence specified. Find the waiting time and turnaround time of each process for the SJF scheduling algorithm in preemptive mode. You must show the Gantt chart and all the steps leading to the result.	8

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

2	a)	What are the three requirements that a solution to the critical-section problem must satisfy? Explain each of them in a sentence.	6
	b)	What are the two types of Semaphores? Write two short functions that implement the wait() and signal() semaphore operations.	6
	c)	(i) How are the processes synchronized? Explain each of them in a sentence (ii) Write the algorithm for the producer-consumer problem.	8 (4+4)

3	a)	(i) Consider a system with single level paging and page size equal to frame size. If the page size is 2048 bytes and the process size is 72766 bytes, then what is the number of pages allocated and what type of fragmentation it leads to? Explain your answer. (ii) On a system with 1-KB page size and 32 bits address size, what is the page number and offset (both in decimal) for the address reference 3085 (provided as decimal number)? Explain your answer.	6 (3+3)
	b)	Consider the following page reference string: **1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6** How many page faults would occur for **LRU** page replacement algorithms assuming **four** frames? Remember all the frames are initially empty. Your answer must show all steps leading to the result.	6

	c)	(i) What is segmentation? Explain how segmentation supports the programmer view of memory.
		
		(ii) Consider a paging system with the page table stored in memory.
		    • If a memory reference takes 200 nanoseconds, how long does a paged memory reference take? Justify your answer.
		    • If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there)
			8
			(4+4)

4	a)	Compare the throughput achieved by a RAID level 5 organization with that achieved by a RAID level 1 organization for the following: (i) Read operations on single blocks (ii) Read operations on multiple contiguous blocks	4 (2+2)
	b)	Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is: **86,1470,913,1774,948,1509,1022,1750,130** Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? (You must show all the steps leading to the result) i. **FCFS** ii. **SSTF**	8 (4+4)
	c)	(i) Explain with a diagram three major layers of NFS Architecture. (ii) Why does Linux's ext3 file system provide the option to journal only metadata?	8 (6+2)
5	a)	Explain any 3 common methods of Program Threats that cause security breaches.	6
	b)	(i) Discuss the strengths and weaknesses of implementing an access matrix using access lists that are associated with objects (ii) Discuss the strengths and weaknesses of implementing an access matrix using capabilities that are associated with domains.	6 (3+3)

	c)	(i) Explain briefly principle of least privilege and need-to-know principle in System Protection?
		(ii) Which of these is an example of a capability-based system, and which is an ACL-based approach?
		    • You give your friend a key to your apartment
		    • A fancy club has a list of approved guests
		    • Some hostel rooms in your college have card-swipe access, where the magnetic code on the card is matched against a list of residents
		    • Your car has a parking permit, listing where you're allowed to park.
			8
			(4+4)