



**PES University, Bangalore**  
(Established under Karnataka Act No. 16 of 2013)

UE14CS302

NOV-DEC 2016: END SEMESTER ASSESSMENT (ESA)

B.TECH. V SEMESTER CSE

UE14CS302 - INTRODUCTION TO OPERATING SYSTEMS

Time: 03 Hrs	Answer All Questions	Max Marks: 100
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1a.	Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.	5M																																																															
1b.	Why is the separation of mechanism and policy desirable in Operating Systems?	5M																																																															
1c.	Discuss, with examples, how the problem of maintaining coherence of cached data manifests itself in the following processing environments: i. Single-processor systems ii. Multiprocessor systems iii. Distributed systems	5M																																																															
1d.	What is the difference between an Independent Process(s) and Cooperating Process(s)? List the advantages of Process Cooperation.	5M																																																															
2a.	Explain the concept of single threaded Process and Multi threaded Process with the help of a neat block diagram.	5M																																																															
2b.	Maintaining data consistency requires mechanisms to ensure the orderly execution of cooperating processes. What kinds of problems occur if this is not carefully handled?	5M																																																															
2c.	<p>Given the following snapshot, check whether the system is currently in safe state. If so find the safe sequence.</p> <table><thead><tr><th></th><th colspan="4">Allocation</th><th colspan="4">Max</th></tr><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>A</th><th>B</th><th>C</th><th>D</th></tr></thead><tbody><tr><td>P0</td><td>2</td><td>1</td><td>2</td><td>1</td><td>7</td><td>6</td><td>5</td><td>4</td></tr><tr><td>P1</td><td>4</td><td>4</td><td>3</td><td>4</td><td>6</td><td>7</td><td>6</td><td>6</td></tr><tr><td>P2</td><td>3</td><td>2</td><td>7</td><td>1</td><td>6</td><td>5</td><td>9</td><td>3</td></tr><tr><td>P3</td><td>3</td><td>1</td><td>3</td><td>1</td><td>4</td><td>4</td><td>3</td><td>3</td></tr><tr><td>P4</td><td>1</td><td>6</td><td>1</td><td>9</td><td>8</td><td>7</td><td>3</td><td>9</td></tr></tbody></table> <p><math>R_{max} = \langle 15, 18, 18, 20 \rangle</math></p> <p>Can a new request by P3 <math>\langle 1, 0, 1, 0 \rangle</math> be granted immediately.</p>		Allocation				Max					A	B	C	D	A	B	C	D	P0	2	1	2	1	7	6	5	4	P1	4	4	3	4	6	7	6	6	P2	3	2	7	1	6	5	9	3	P3	3	1	3	1	4	4	3	3	P4	1	6	1	9	8	7	3	9	10M
	Allocation				Max																																																												
	A	B	C	D	A	B	C	D																																																									
P0	2	1	2	1	7	6	5	4																																																									
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P3	3	1	3	1	4	4	3	3																																																									
P4	1	6	1	9	8	7	3	9																																																									
3a.	Explain the concept of internal and external fragmentation using appropriate diagrams.	5M																																																															
3b.	Consider the following page reference string: 1,2,1,2,1,7,6,1,2,7,6,7,8,9,1,2,3,4,5,6,7 Assuming demand paging with Two frames, how many page faults would occur if we apply Optimal Page replacement Policy?	5M																																																															

3c.	Consider the following set of processes, with the length of the CPU burst time given in milliseconds:				10M
	Process	Burst Time	Arrival Time	Priority	
	P1	012	0	1	
	P2	022	0	2	
	P3	112	0	2	
	P4	033	0	2	
P5	018	0	1		
Calculate Average Response Time, Average Waiting Time, Average Turnaround Time by applying					
i. Non-Pre-emptive Shortest Job First Scheduling					
ii. Pre-emptive Priority Scheduling					
4a.	The open-file table is used to maintain information about files that are currently open. Should the operating system maintain a separate table for each user or just maintain one table that contains references to files that are being accessed by all users at the current time? If the same file is being accessed by two different programs or users, should there be separate entries in the open file table?				6M
4b.	Discuss how performance optimizations for file systems might result in difficulties in maintaining the consistency of the systems in the event of computer crashes.				6M
4c.	Discuss the advantages and disadvantages of supporting links to files that cross mount points (that is, the file link refers to a file that is stored in a different volume).				6M
4d.	Consider a file system that uses inodes to represent files. Disk blocks are 8-KB in size and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, plus single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?				2M
5a.	None of the disk-scheduling disciplines, except FCFS, is truly fair (starvation may occur). i. Explain why this assertion is true. ii. Describe a way to modify algorithms such as SCAN to ensure fairness. iii. Explain why fairness is an important goal in a time-sharing system. iv. Give three or more examples of circumstances in which it is important that the operating system be <i>unfair</i> in serving I/O requests.				8M
5b.	Suppose that a disk drive has 1,000 cylinders, numbered 0 to 999. The drive is currently serving a request at cylinder 150, and the previous request was at cylinder 805. The queue of pending requests, in FIFO order, is:  206, 212, 296, 280, 544, 618, 356, 153, 465, 361  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 by applying C-SCAN disk-scheduling algorithm.				7M
5c.	What are the advantages and disadvantages of supporting memory-mapped I/O to device-control registers?				5M