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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Information Science and Engineering

Semester End Examination; Sep. / Oct. - 2023

Operating System

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply Various Process Scheduling Algorithms, Disk Scheduling algorithms, Page replacement algorithms and Deadlock detection and avoidance techniques for providing Operating System functionalities.

CO2: Analyze and interpret operating system concepts to acquire a detailed understanding of the course.

CO3: Understand and explore the fundamental concepts of various operating system services.

CO4: Conduct experiments using Programming Language to demonstrate the Basic features of Operating System.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q.No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Write all five states where process will be in the operating system.	2	L2	CO3	PO1
b.	Give reason, why threads are called as light weighted process?	2	L1	CO3	PO1
c.	What is critical section problem?	2	L1	CO3	PO1
d.	What are the necessary conditions to be hold simultaneously, which makes a system to be in deadlock state?	2	L1	CO3	PO1
e.	What is copy-on-write?	2	L1	CO3	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	With a neat diagram, explain various services provided by operating system.	9	L2	CO3	PO1
b.	What are the different fundamental models of inter-process communication? Explain in detail.	9	L2	CO3	PO1
c.	Explain various computer systems architecture based on number of general purpose processors used.	9	L2	CO3	PO1
	UNIT - II	**18**			
3 a.	What are threads? Explain three common ways of establishing a relationship between user threads and kernel threads.	9	L2	CO3	PO1
b.	Explain how continguous allocation method to utilize the disk space effectively.	9	L2	CO3	PO1
c.	Explain the benefits of multithreaded programming.	9	L2	CO3	PO1

Contd….2

UNIT - III **18**

4 a. Explain Peterson's solution for critical section problem and illustrate with an example. 9 L2 CO3 PO1

b. Consider the following set of process;

Process	Arrival Time (ms)	Burst time (ms)
P_0	0	6
P_1	1	3
P_2	2	4
P_3	2	5
P_4	3	1

9 L3 CO1 PO1,2,3

i) Draw the Gantt chart, illustrating the execution of above processes using Shortest Remaining Time First [SRTF] and non-primitive SJF.

ii) Calculate average turnaround time and average waiting time.

c. Consider the following set of process with the length of the CPU burst given in millisecond and all the process arrive at 0 ms.

Process	Burst time	Priority
P_1	2	2
P_2	1	1
P_3	8	4
P_4	4	2
P_5	5	3

i) Draw a Gantt chart that illustrate that the execution of above process using following scheduling algorithms; 9 L4 CO2 PO1,2,3

- Preemptive priority (higher priority, higher value)
- Round Robin (Quantum = 2)

ii) Calculate average waiting time

iii) Which of the algorithm results in the minimum average waiting time? Why?

UNIT - IV **18**

5 a. Illustrate how to prevent the occurrence of deadlock in the system. 9 L3 CO1 PO1,2,3

b. Consider the following snapshot of a system,

	Allocation				MAX				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	2	0	0	1	4	2	1	2	3	3	2	1
P_1	3	1	2	1	5	2	5	2				
P_2	2	1	0	3	2	3	1	6				
P_3	1	3	1	2	1	4	2	4				
P_4	1	4	3	2	3	6	6	5				

9 L3 CO1 PO1,2,3

i) Illustrate that the system is in a safe state by demonstrating an order in which the processes may complete.

ii) If request from process P_1 arrives for (1, 1, 0, 0) and P_4 arrives for (0, 0, 2, 0) than can the request be granted immediately.

Contd....3

	c.	Explain difference between internal and external fragmentation. Consider six memory partition of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB and 125 KB(in order), how would the first fit, best-fit and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB and 375 KB(in order)? Rank the algorithms in terms of how efficiently they use memory.	9	L4	CO2 PO1,2
		UNIT - V	**18**		
6	a.	Consider the following page reference string: 7, 2, 3, 1, 2, 5, 3, 4, 6, 7, 7, 1, 0, 5, 4, 6, 2, 3, 0, 1 i) Assuming demand paging with three frames, how many page faults would occur for the following replacement algorithms? LRU Replacement FIFO Replacement ii) Analyze which is efficient with respect to number of page faults.	9	L3	CO1 PO1,2,3
	b.	What is demand paging? Illustrate the procedure for handling page fault.	9	L2	CO3 PO1
	c.	Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2150, and the previous request was at cylinder 1805. The queue of pending requests in FIFO order is 2069, 1212, 2296, 2800, 544, 1618, 356, 1523, 4965, 3681 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending request for each of the following disk scheduling algorithm? i) FCFS ii) SSTF iii)SCAN	9	L3	CO1 PO1,2,3

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