Total number of printed pages: **2** **D/4th/DCSE404**

2025

Operating System

Full Marks : 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	Answer the following.		10x2=20
	a)	Define multitasking.	
	b)	What do you mean by a system call?	
	c)	State the difference between process and program.	
	d)	Mention the different states of a process.	
	e)	What is a thread?	
	f)	Define context switching.	
	g)	What is the difference between preemptive and non-preemptive scheduling?	
	h)	How does priority scheduling work?	
	i)	What do you mean by starvation?	
	j)	What is inter-process communication (IPC)?	
2.	a)	Explain the Dining Philosophers Problem in the context of process synchronization. Discuss how to solve it using a semaphore.	3+6=9
	b)	What do you mean by CPU scheduling? Discuss and compare the FCFS and SJF scheduling algorithms.	2+4=6
	c)	Consider the following set of processes with their arrival and burst times: **Process** / **Arrival Time** / **Burst Time** P1 / 0 ms / 8 ms P2 / 1 ms / 4 ms P3 / 2 ms / 9 ms P4 / 3 ms / 5 ms Draw the Gantt chart and calculate the average waiting time of the processes for the pre-emptive shortest Job First (SJF) scheduling algorithm.	5
3.	a)	State the differences between logical and physical address spaces.	3
	b)	Describe paging with a suitable diagram.	8

	c)	Explain internal and external fragmentation with examples.	6
	d)	What do you mean by swapping?	3
4.	a)	Under what circumstances do page faults occur? Describe the actions (steps) taken by the operating system when a page fault occurs.	3+6=9
	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 the following replacement algorithms, assuming four(4) frames? **Note:** All frames are initially empty.	9
		i) LRU replacement ii) FIFO replacement	
		iii) Optimal replacement	
	c)	What do you mean by demand paging?	2
5.	a)	Define a deadlock. List out the necessary conditions for a deadlock to occur.	2+5=7
	b)	What do you mean by a resource allocation graph? Give examples.	4
	c)	Consider the following snapshot of a system: Allocation / Max / Available A B C D / A B C D / A B C D P0 0 0 1 2 / 0 0 1 2 / 1 5 2 0 P1 1 0 0 0 / 1 7 5 0 P2 1 3 5 4 / 2 3 5 6 P3 0 6 3 2 / 0 6 5 2 P4 0 0 1 4 / 0 6 5 6 Answer the following questions using Banker's algorithm:	3+3+3=9
		i) What is the content of the matrix Need?	
		ii) Is the system in a safe state?	
		iii) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?	
6.	a)	List out the attributes of a file. Discuss any two file access methods in brief.	5+6=11
	b)	What is the function of a device driver?	2
	c)	Illustrate how an I/O device communicates with the CPU using a bus, with the help of a labelled diagram.	7
7.		Write short notes on any four(4) of the following:	4x5=20
	a)	Segmentation	
	b)	Virtual memory	
	c)	Interrupt	
	d)	Direct Memory Access(DMA)	
	e)	Distributed System	