Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Operating Systems **Semester: II**

Program: MCA(All-Specialization) **Time : 03 hrs.**

Course Code: CSEG7012 **Max. Marks: 100**

Instructions: All questions are compulsory

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	List different types of CPU scheduling algorithms.	**4**	**CO2**

Q 2	Define system call and predict the output of the following:
	#include <stdio.h>
	#include <unistd.h>
	int main() {
	fork();
	fork();
	printf("Hello\n");
	return 0;
	}
		2+2	**CO1**

Q 3	State clearly the role of program counter in the process control block.	**4**	**CO2**
Q 4	Defend how time-sharing operating systems differ from multiprogramming?	**4**	**CO1**
Q 5	How does logical address space differ from logical address?	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	• Consider a single-core CPU executing two processes using time-sharing (context switching). Each process contains a loop of 5 instructions. Assume the scheduler switches between processes after every 2 instructions. How does the Program Counter behave during these context switches, and how many times will the Program Counter be updated while executing both processes fully? • Draw a neat sketch that represents the different states of a process and explain it in brief taking into consideration long term, short term and medium-term schedulers.	**4+6**	**CO3**

Q 7	Describe semaphore, and how semaphore solves the problem of Reader Writer problem.	**10**	**CO4**
Q 8	Explain the role of the page table in memory management. Consider a system with LA is 27 bits and the physical address is 21bits. The page size is 4Kwords. Calculate the number of pages and number of frames.	**5+5**	**CO5**
Q 9	Demonstrate the working of DMA by outlining data transfer without CPU intervention. **Or** What are the four important conditions of the deadlock? Draw a suitable sketch to illustrate a system is in deadlock with resource allocation graph.	**10**	**CO5**
SECTION-C (2Qx20M=40 Marks)			
Q 10	i. Consider the set of 4 processes whose arrival time and burst time has given below. If the scheduling policy is Longest Job First (LJF) preemptive, calculate the average waiting time and turnaround time. Process ID Arrival time Burst time P1 1 2 P2 2 4 P3 3 6 P4 4 8 ii Explain with an example how internal and external fragmentation is caused. How dynamic partitioning helps to avoid external fragmentation?	**10+10**	**CO4**
Q 11	You are given the following page reference string: 7,0,1,2,0,3,0,4,2,3,0,3,3,2 and a memory that can accommodate 3-page frames. Critically analyze the performance of the following page replacement algorithms when applied to this reference string: o **FIFO (First-In-First-Out)** o **LRU (Least Recently Used)** o **Optimal Page Replacement** For each algorithm: o Determine the number of page faults o Determine the number of page hits o Illustrate the step-by-step memory state changes Based on your observations, compare the algorithms in terms of their efficiency, adaptability, and real-world feasibility. Finally, discuss the concept of Belady's Anomaly. Does it occur in the FIFO algorithm for this reference string when memory frames are increased from 3 to 4? Justify your answer with a concrete example. **Or** Draw the hard disk structure and state the meaning of seek time. Given the following disk request sequence: 98,183,37,122,14,124,65,67 and the initial head position at 53, evaluate and compute the total head movement using the following disk scheduling algorithms:	**20**	**CO5**

	• FCFS • SSTF • SCAN (Assume the disk size is 200, and the head moves toward higher-numbered cylinders initially) Based on your calculations, critically analyze which algorithm is most efficient?		