NATIONAL OPEN UNIVERSITY OF NIGERIA

PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI-ABUJA

FACULTY OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE

B. SC. COMPUTER SCIENCE PROGRAMME

2024_2 EXAMINATION

COURSE CODE:	CIT 315	COURSE TITLE:	OPERATING SYSTEMS
COURSE UNIT:	3	TIME:	2 HOURS 45 MINUTES
INSTRUCTION(S):	ANSWER QUESTION ONE (1) AND ANY OTHER THREE (3) QUESTIONS		

Question One

(a) Consider a logical address space of eight pages of 1024 words, each mapped onto a physical memory of 32 frames.

i. How many bits are in the logical address? **[5 Marks]**

ii. How many bits are in the physical address? **[5 Marks]**

(b) Define race condition in the context of concurrent programming and explain how it can occur. **[6 Marks]**

(c) Describe the steps involved in creating a thread using pthreads. **[5 Marks]**

(d) Compare and contrast the operation of cache for read and write operations. **[4 Marks]**

Question Two

(a) i. Define a thread. **[3 Marks]**

ii. Differentiate between a thread and a process. **[4 Marks]**

(b) What is the purpose of multithreading in operating systems? **[3 Marks]**

(c) Explain the concept of POSIX threads (pthreads) and their usage. **[5 Marks]**

Question Three

(a) In the context of an airline reservation system using a centralized database, discuss whether it is preferable to use threads or processes. **[6 Marks]**

(b) Describe the concept of data access synchronization and its significance in preventing race conditions. **[4 Marks]**

(c) Explain the concept of critical regions and how they help to achieve mutual exclusion. **[5 Marks]**

Question Four

(a) Define deadlock and explain why it occurs in process synchronization and resource sharing. **[5 Marks]**

(b) Describe the deadlock detection approach and algorithm. **[5 Marks]**
(c) Discuss the concept of safe state and its relationship to deadlock avoidance. **[5 Marks]**

Question Five

(a) Explain the concept of virtual memory and its components. **[4 Marks]**
(b) i. What is paging and how does it work? **[3 Marks]**
ii. How does the size of a page or segment affect memory management? **[3 Marks]**
(c) What are the two main places to implement threads? Explain briefly. **[5 Marks]**

Question Six

(a) Explain the concept of thread states and their significance in thread management. **[5 Marks]**
(b) Discuss the properties that a critical section implementation must satisfy. **[4 Marks]**
(c) Name three ways to switch between user mode and kernel mode in a general-purpose operating system. **[6 Marks]**