



COMSATS UNIVERSITY ISLAMABAD (CUI)

DEPARTMENT OF COMPUTER SCIENCE

FALL 2023

MID-TERM EXAMINATION

Course: CSC322-Operating Systems

Maximum Marks: 25

Class: BCS A& B

Instructor: Zahida Walayat

Dated: November 13, 2023.

Question No. 1:

Total Marks: 10

(CLO-1)

CLO 1-Elaborate concepts and principles of operating systems.

Part 1: Differentiate the following: (3)

- multi-tasking and multi-programming operating systems
- symmetric and asymmetric multiprocessing
- fault-tolerance and graceful-degradation

Part 2: Operating systems are usually interrupt-driven. What are interrupts? Differentiate interrupts and traps. Also, discuss the interrupt handling process in detail. (3)

Part 3: The services and functions provided by an operating system can be divided into two main categories. Discuss in detail the two categories and the services provided by the OS under each category. (4)

Question No. 2:

Total Marks: 15

CLO-2

CLO 2-Analyze various operations performed by operating system for process management.

Part 1: An operating system creates many data structures to manage processes. Process control block (PCB) is one of these. Examine the PCB and its role in context-switching. Also, differentiate the structure of PCB of single-threaded and multi-threaded applications. (4)

Part 2: Analyse the working of wait and exit system-calls in process termination on Linux operating system. Also discuss the role of init process in process termination. (3)

Part 3: Using Amdahl's Law, calculate the speedup gain of an application that has a 60 percent parallel component for (a) two processing cores (b) to gain a speedup of 2 how many cores are required. (2)

Part 4: Explain if the following problems exhibit task or data parallelism: (2)

- Using a separate thread to generate a thumbnail for each photo in a collection
- Finding sum of an array in parallel

Part 5: Suppose an application consists of three processes as given below:

Process 1	Process 1	Process 1
int main ()	int main ()	int main ()
{	{	{
S1	S2	S3
}	}	}

Add the appropriate code to ensure that S2 is executed first, then S3 and in the end S1 is executed. (4)

The End

Part 2: Some operating systems use a medium-term scheduler for managing processes. What is this scheduler and why it is required? (2) Unbounded

Part 3: If during the execution one thread is blocked then what will be its impact on other threads under the following models (give reasons as well): many-to-one, one-to-one and many-to-many (3)

Part 4: Consider the following set of processes given in the following table. Draw a Gantt chart showing their execution using the SJF preemptive scheduling. Also find the waiting time of process P3 and P4. (5)

Multi

Process ID	Burst Time	Arrival Time
P0	8	2
P1	10	0
P2	6	4
P3	12	5
P4	12	6
P5	2	7
P6	6	8
P7	2	10

Part 5: Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned.

Method Used by P1	Method Used by P2
while (S1 == S2) ;	while (S1 != S2) ;
Critical Section	Critical Section
S1 = S2;	S2 = not (S1);

Keeping in mind the methods used by both processes, figure out why process P1 cannot re-enter its critical section immediately after executing once in its critical section. (3)

P1 | P5 | P2 | P7 | P3 | P6 | P0 | P4