SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology

Second Year, First Semester Examination – 2023

HNDIT 3052 – Operating Systems

Instructions for Candidates:
Answer only four (4) questions.
All questions carry equal marks.
Calculators are Allowed.

No. of questions: 5
No. of pages : 3
Time: Two (2) hours

Question 01

i. List four reasons for installing an operating system. [4 Marks]

ii. What do you mean by "system calls"? [3 Marks]

iii. What is a bootstrap program? Provide two benefits of it. [4 Marks]

iv. Briefly describe the following concepts regarding operating systems. [6 Marks]

a) Multitasking
b) Multiprogramming

v. Provide two features for each of the following operating systems. [8 Marks]

a) MS Windows
b) Android
c) Linux
d) Apple MacOS

(Total 25 Marks)

Question 02

i. What is a process and a process table? [4 Marks]

ii. List four differences between a process and a program. [4 Marks]

iii. Process Control can be achieved using the following system calls. Write the functions of each of following system calls. [4 Marks]

a) fork ()
b) exec ()
c) exit ()
d) wait ()

iv. Briefly describe the following. [4 Marks]

a) Cooperate Process
b) Independent Process

v. Discuss the following requirements of the critical section problem. [9 Marks]

a) Mutual Exclusion
b) Progress
c) Bounded Waiting

(Total 25 Marks)

Question 03

i. List four goals of CPU scheduling. [4 Marks]

ii. Consider the following three processes to run on a single CPU. All times are in milliseconds:

Process	Arrival Time	Burst Time
P1	0	8
P2	1	2
P3	4	3

a) Draw the Gantt chart for the execution of the above processes using the **Shortest Remaining Time First (SRTF)** and **First Come First Serve (FCFS)** algorithms. [6 Marks]

b) Calculate the average waiting time for SRTF and FCFS algorithms. [6 Marks]

c) Which algorithm is the better? Justify your answer. [2 Marks]

iii. List three advantages of multithreading. [3 Marks]

iv. Briefly describe the following: [4 Marks]

a) User-Level Threads

b) Kernel-Level Threads

(Total 25 Marks)

Question 04

i. What are the necessary conditions for a system to encounter a deadlock? [4 Marks]

ii. List four main approaches for dealing with deadlocks. [4 Marks]

iii. Apply Banker's Algorithm to answer the following:

Processes	Allocation A B C	Max A B C	Available A B C
P0	1 1 2	4 3 3	2 1 0
P1	2 1 2	3 2 2	
P2	4 0 1	9 0 2	
P3	0 2 0	7 5 3	
P4	1 1 2	1 1 2	

a) Calculate the content of the need matrix. [5 Marks]

b) Find the safe sequence of the above processes, if any. [8 Marks]

c) Determine the total number of instances of each resource. [4 Marks]

(Total 25 Marks)

Question 05

i. List three types of address binding techniques. [3 Marks]

ii. What is virtual memory? State three advantages of virtual memory. [5 Marks]

iii. Draw the internal structure of a hard disk, including all components. [6 Marks]

iv. Assume a hard disk with **180** tracks **(0-179)** and the disk queue having input/output requests in the following order: **92, 100, 40, 148, 67, 170, 29, 10**. The initial position of the Read/Write head is 45.

a) Draw a graph to display the arm head movements using the **Shortest Seek Time First (SSTF)** algorithm. [4 Marks]

b) Calculate the total number of track movements of the Read/Write head using the **Shortest Seek Time First (SSTF)** algorithm. [3 Marks]

v. What is a file system? Give two examples. [4 Marks]

(Total 25 Marks)