SLIATE

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Jumail-0039

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 – 2022

HNDIT3052 – Operating Systems (NEW)

Instructions for Candidates:	No. of questions 05
Answer only four (04) questions	No. of pages 03
All questions carry equal marks	Time: Two (2) hours

Question 01

i. What is an operating system? [02 marks]

ii. List five functions of an operating system. [05 marks]

iii. Briefly describe the two modes in an operating system. [06 marks]

a) User space

b) Kernel space

iv. Write down the use of the following system calls. [04 marks]

a) fork ()

b) exit ()

v. Give two examples for each of the following operating system types. [08 marks]

a) Network operating systems

b) Mobile operating systems

a) Real-time operating systems

b) Multi-tasking operating systems

[Total 25 Marks]

Question 02

i. List five different states of a process. [05 marks]

ii. State three differences between a process and a thread. [03 marks]

iii. What is context switching? [02 marks]

iv. Briefly describe the following. [06 marks]

a) Process control block.

b) Thread control block.

v. Using a diagram describe the following Multithreading models. [09 marks]

a) One-to-one model.

b) Many-to-many model.

c) Many-to-one model.

[Total 25 Marks]

Question 03

i. What are the key requirements that any solution to the critical section problem must satisfy? [03 marks]

ii. Briefly describe the following terms in process synchronisation. [04 marks]
   a) Race condition
   b) Critical section

iii. Briefly describe the following terminologies in CPU scheduling. [04 marks]
   a) Burst time
   b) Waiting time
   c) Completion time
   d) Arrival time

iv. Process scheduling can be preemptive or non-preemptive. Briefly describe these approaches by giving **one example algorithm** for each. [04 Marks]

v. Consider the following four processes to run in a single CPU. All times are given in milliseconds.

Process	Arrival Time	Burst Time
P1	0	8
P2	3	3
P3	5	4
P4	6	6

   a) Draw the Gantt chart to show the execution of the above process for **First Come First Serve (FCFS)** and **Shortest Remaining Time First (SRTF)** algorithms. [04 marks]
   b) Calculate the average waiting time when scheduling these processes according to **FCFS** and **SRTF** algorithms. [04 marks]
   c) Which algorithm is the best? Justify your answer. [02 marks]

[Total 25 Marks]

P.T.O.

Question 04

i. Define deadlock in the operating system. [02 Marks]

ii. Apply Banker's Algorithm to answer the following questions.

Process	Max			Allocation			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	7	5	3	0	1	0	3	3	4
P2	3	2	2	2	0	0			
P3	9	0	2	3	0	2			
P4	2	2	2	2	1	1			

a) Find the safe sequence of the above processes, if any. [04 Marks]

b) Find the total number of instances of each resource. [03 Marks]

iii. Describe the difference between the following. [06 marks]

a) Synchronous I/O vs Asynchronous I/O.

b) Poling I/O vs Interrupt I/O.

iv. Compare and contrast a single-level directory structure and a tree-level directory structure. [04 marks]

v. Consider a disk with 8 surfaces, 256 sectors per track, 64 tracks per surface and a sector can store 512 bytes. The disk is rotating at 3600 RPM, Find the following.

a) The disk capacity. [03 Marks]

b) Data transfer rate. [03 Marks]

[Total 25 Marks]

Question 05

i. Describe the memory management. State two reasons for managing memory. [04 marks]

ii. State the differences between a logical and physical memory address. [03 marks]

iii. Modern computers store data in various "memories", each with differing sizes and access speeds. Briefly describe each of the following:

a) cache memory. [02 marks]

b) main memory. [02 marks]

c) registers. [02 marks]

iv. Briefly describe the difference between paging and segmentation. [03 Marks]

v. Describe the following terms. [09 Marks]

a) Memory Management Unit.

b) Swapping.

c) Virtual memory.

[Total 25 Marks]