

UNIVERSITY OF RUHUNA

**BACHELOR OF SCIENCE GENERAL DEGREE LEVEL II (SEMESTER I)
EXAMINATION – JULY 2023**

SUBJECT : COMPUTER SCIENCE
COURSE UNIT : COM213α - Operating Systems

Time: 1 hour

Answer Only 02 Questions.

1.
 - a. Briefly explain how interrupts function in operating systems. (10 marks)
 - b. Write corresponding Unix system calls for the given Windows system calls and briefly explain each of them (i.e. Unix calls). (30 marks)
 - i. CreateProcess()
 - ii. CreatePipe()
 - iii. ExitProcess()
 - c. “It is more economical to create and context switch threads”. Briefly explain this statement. (10 marks)
 - d. Explain briefly “Ready” and “Waiting” states of any given finite process. (10 marks)
 - e. State two (2) pieces of data required to manage an open file and briefly explain one of that. (15 marks)
 - f. A file may have several absolute path names while using acyclic graph directories. What is a dangling pointer there? (05 marks)
 - g. Answer the following questions (i) and (ii) by considering page replacement algorithms. (20 marks)
 - i. “There is no external fragmentation with linked allocation”. State whether the above statement is correct and justify your answer.
 - ii. What is an ‘index block’ in indexed allocation?
 - iii. Briefly explain the main problem of having a small index block in indexed allocation.

2.

- a. State whether the following statements are True/False. (15 marks)
- The cost of switching between threads is much higher than the cost of switching between processes
 - Kernel threads are supported directly by the operating system
 - Threads within a single process share address spaces
- b. Briefly explain the difference between CPU bound processes and I/O bound processes. (20 marks)
- c. "Multi-core processing is more efficient than placing each processor on its own chip separately". Do you agree with the statement? Justify your answer. (10 marks)
- d. Explain the process of Starvation and how aging can be used to prevent it. (20 marks)
- e. Consider five (5) processes P_0 through P_4 and four types of resources A, B, C and D. Consider the following snapshot of a system. (35 marks)

Process	Allocation	Maximum	Available	Need
	A B C D	A B C D	A B C D	A B C D
P_0	0 1 1 0	0 2 1 0	1 5 2 0	
P_1	1 2 3 1	1 6 5 2		
P_2	1 3 6 5	2 3 6 6		
P_3	0 6 3 2	0 6 5 2		
P_4	0 0 1 4	0 6 5 6		

Table 01

- Write the contents of Need column in Table 01.
- Is the system in a safe state? Briefly explain.



3.

- a. A pair of base and limit registers specifies the logical address space. The base and limit registers can be loaded only by the operating system. Explain the main functionalities of these two registers. (10 marks)
- b. Briefly explain two possible memory fragmentations: external and internal. (10 marks)
- c. "External fragmentation can be prevented (almost completely) by frequent use of compaction, but the cost would be too high for most systems." State whether the given statement is true/false and justify your answer. (20 marks)
- d. State one (01) main issue in Fixed-sized partitioning. (10 marks)
- e. Briefly explain the following two criteria in terms of CPU scheduling. (20 marks)
 - i. Throughput
 - ii. Response time
- f. A set of processes, their arrival times and their burst times are given in the following Table 2. Use the table to answer the following questions. (30 marks)

Process	Arrival Time (ms)	Burst Time(ms)
P ₁	0	7
P ₂	2	2
P ₃	3	3
P ₄	5	6

Table 2

- i. Draw a Gantt chart to depict the scheduling under Shortest Job First scheduling algorithm.
- ii. Calculate the average waiting time of the processes under Shortest Job First scheduling.
- iii. Calculate the average waiting time of the processes under First Come First Served scheduling.

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