

UNIVERSITY OF RUHUNA

**BACHELOR OF SCIENCE (GENERAL) DEGREE LEVEL II (SEMESTER I)
EXAMINATION – AUGUST 2017**

SUBJECT : COMPUTER SCIENCE
COURSE UNIT : COM2132/COM213β - Operating Systems

Time: 1 hour

Answer two (2) questions only.

1.

- a. Operating systems are interrupt-driven. What is meant by interrupts in the context of operating systems? (10 marks)
- b. Classify the following into hardware and software interrupts. (20 marks)
 - i. Program
 - ii. Timer
 - iii. Input/Output
 - iv. Failure of the processor
- c. "It is more economical to create and context switch threads". Explain the statement briefly. (10 marks)
- d. Briefly explain the functionality of following system calls. (20 marks)
 - i. exit()
 - ii. abort()
- e. State two (02) pieces of data required to manage an open file and briefly explain one. (15 marks)
- f. A file may have several absolute path names while using acyclic graph directories. Briefly explain the problem you identify there? (05 marks)
- g. Answer following i., ii., and iii. considering file allocation methods. (20 marks)
 - i. "There is no external fragmentation with linked allocation". State whether the above statement is correct/not. 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. Briefly explain the difference between CPU bound processes and I/O bound processes. (10 marks)
- b. State why multi-core processing is more efficient than placing each processor on its own chip separately. (10 marks)

- c. "Operating systems can be viewed as resource allocators". Briefly explain this statement. (10 marks)
- d. Explain the process of starvation and how aging can be used to prevent it. (20 marks)
- e. A semaphore value 'S' is a synchronization tool and can access only through two standard atomic operations wait () and signal (). Write sample c code segments to explain these two operations. (20 marks)
- f. Consider five processes P₀ through P₄ and four types of resources A, B, C and D with 1, 5, 2 and 0 instances of them respectively. Consider the following snapshot of a system. (30 marks)

Process	Allocation				Maximum				Need			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	0	1	1	0	0	2	1	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

Use Banker's Algorithm to answer the following questions.

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

3.

- A pair of base and limit registers specifies the logical address space and these registers can be loaded only by the operating system. Explain the main functionalities of these two registers giving an example. (10 marks)
- Briefly explain external and internal memory fragmentations. (10 marks)
- "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. Justify your answer. (20 marks)
- State two (02) problems in fixed-sized partitioning. (10 marks)
- There are different criteria to consider when comparing CPU scheduling algorithms. Briefly explain following two criteria that can be used. (20 marks)
- A set of processes, their arrival times and the burst times are given in the following Table 2. Use the table to answer the questions. (30 marks)

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