



**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR JANUARY/APRIL 2023/2024 CERTIFICATE IN INFORMATION TECHNOLOGY**

**COURSE CODE: RCT 005**

**COURSE TITLE: INTRODUCTION TO OPERATING SYSTEMS.**

DATE: --/--/2024.

TIME: 2 HOURS.

**GENERAL INSTRUCTIONS:**

Students are NOT permitted to write on the examination question paper during exam time.

This is a closed book examination. Text book/Reference books/notes are not permitted.

**SPECIAL INSTRUCTIONS:**

This examination paper consists Questions in Section A followed by section B.

Answer Question 1 and any Other Two questions.

QUESTIONS in ALL Sections should be answered in answer booklet(s).

- 1. PLEASE start the answer to EACH question on a NEW PAGE.**
- 2. Keep your phone(s) switched off at the front of the examination room.**
- 3. Keep ALL bags and caps at the front of the examination room and DO NOT refer to ANY unauthorized material during the course of the examination.**
- 4. ALWAYS show your working.**
- 5. Marks indicated in parenthesis i.e. ( ) will be awarded for clear and logical answers.**
- 6. Write your REGISTRATION No. clearly on the answer booklet(s).**
- 7. For the Questions, write the number of the question on the answer booklet cover page in the order you answered them.**
- 8. DO NOT use your PHONE as a CALCULATOR.**
- 9. YOU are ONLY ALLOWED to leave the exam room 1hour to the end of the Exam.**
- 10. DO NOT write on the QUESTION PAPER. Use the back of your BOOKLET for any calculations or rough work.**
- 11. Calculator may be required.**

## SECTION A (COMPULSORY)

### Question (1) - (30Marks)

- a) Define the following terms as used Operating systems. **(5 Marks)**
- i. Compilers.
  - ii. Interpreter.
  - iii. Multi-Tasking.
  - iv. Multi-Processing.
  - v. Multi-Programming.
- b) State **FIVE** Functions of An Operating System as used in computer systems. **(6 Marks)**
- c) Explain the purposes of the following process scheduling queues. **(6 Marks)**
- i. Job Queues.
  - ii. Ready Queues.
  - iii. Devices Queues.
- d) With respect to the processes scheduling, name and explain **FIVE** states that all processes must go through. **(5 Marks)**
- e) Considering the processes table shown below, draw a Gantt chart illustrating the order of processes execution. Use the Round Robin Scheduling Algorithms with a quantum time of 6 units of time. **(4 Marks)**

Processes	Arrival Time	Burst Time
P1	1	26
P2	2	12
P3	3	6
P4	4	18

- f) Discuss **FOUR** types of Kernels used in operating systems. **(4 Marks)**

## SECTION B (Answer Any Two Questions)

### Question (2) - (15 Marks)

- a) Name and briefly explain **FIVE** criteria to consider when choosing a scheduling algorithm in designing an operating system. **(5 Marks)**
- b) Consider the processes shown in the table below and their details. Using *Non-Preemptive Priority Scheduling* algorithm, calculate the overall average wait time that will be used in executing the processes. NB: priority is in *descending* order, i.e. (1 = **Highest** priority, while 10= **Lowest** priority). **(6 Marks)**

Process PID	Arrival Time	Burst Time	Priority
P1	0	8	4
P2	1	6	1
P3	2	1	2
P4	3	9	2
P5	4	3	3

Draw a suitable Gantt chart to visualize the process order of execution.

- c) State **FOUR** components of a Program control block, and hence explain their purpose. **(4 Marks)**

### Question (3) - (15 Marks)

- a) Describe **FIVE** Files operations facilitated by the operating system, in files management. **(5 Marks)**
- b) State and discuss in details, any **FIVE** Scheduling Algorithms used in the modern operating systems. **(10 Marks)**

#### **Question (4) - (15 Marks)**

- a) Define the term system call. **(1 Marks)**
- b) Explain the purposes of shells and kernels components of operating systems. **(2 Marks)**
- c) State **FIVE** types of systems calls and in each give an example. **(5 Marks)**
- d) Compare Pre-emptive scheduling and Non- Pre-emptive Scheduling. **(2 Marks)**
- e) Describe the following term as used in operating systems. **(5 Marks)**
- i. Swapping.
  - ii. Dispatcher.
  - iii. Scheduling.
  - iv. Virtual memory.
  - v. Context switching.

#### **Question (5) - (15 Marks)**

- a) Describe the terms **Semaphore** and **Mutex**, and hence **explain** how they are used in operating systems. **(4 Marks)**
- b) The following indicates a part of memory, available for allocation. **(6 Marks)**  
The memory is divided into segments of fixed sizes of the following sizes.  
**[10 KB, 4 KB, 20 KB, 18 KB, 7 KB, 9 KB, 12 KB, 15KB]**  
Three processes **A, B, and C** with the respective sizes of **[12 KB, 10 KB and 9 KB]** is to be mapped / allocated space in the memory successively.  
Show how the processes will be allocated using the following allocation techniques.
- i. Worst fit.
  - ii. Next fit.

iii. Best fit.

- c) Outline differences between Processes and Threads as referenced in operating systems. **(4 Marks)**
- d) Differentiate between the External Fragmentation and Internal Fragmentation as referenced in memory management by operating systems. **(1 Marks)**

***END***