UNIVERSITY EXAMINATIONS

EXAMINATION FOR JANUARY/APRIL 2023/2024 DIPLOMA IN COMPUTER SCIENCE/DIPLOMA IN INFORMATION TECHNOLOGY/DIPLOMA IN BUSINESS INFORMATION TECHNOLOGY/DIPLOMA IN CYBER SECURITY

COURSE CODE: **RCS 021** 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) Discus **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