

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF COMPUTER SCIENCE AND BACHELOR OF APPLIED COMPUTER
SCIENCE

COSC 222: OPERATING SYSTEMS

STREAMS: (BSC COMP. SCI) Y2 S1

TIME: 2 HOURS

DAY/DATE: TUESDAY 23/3/2021

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

- Answer question **ONE** and **TWO** other questions
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write anything on the question paper
- This is a **closed book exam**, no reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

SECTION A

QUESTION ONE-COMPULSORY: 30 MARKS

a) Explain the following terms as they are used in the scheduling criterion:

- CPU utilization.
- Turnaround time.
- Waiting time.
- Response time. [4 Marks]

b) Describe briefly main memory management based on the following:

- Paging [2 Marks]
- Relocation and swapping [2 Marks]

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- c) Explain three different types of processes scheduler, also, draw a graph (include all schedulers and queues) to indicate the relation between two different queues and processes schedulers. [6 Marks]
- d) Describe four-page replacement algorithms. Compare them with each other. [8 Marks]
- e) Describe the two general roles of an operating system, and elaborate why these roles are important. [4 Marks]
- f) Compare I/O based on *polling* with *interrupt-driven I/O*. In what situation would you favour one technique over the other? [4 Marks]

SECTION B Answer Any Two Questions: 40 MARKS

QUESTION TWO (20 MARKS)

- a) Describe three different multithreading models for mapping user threads to kernel threads. Also, describe one advantage or disadvantage for each model. [6 Marks]
- b) Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory? [6 Marks]
- c) Name four disk-arm scheduling algorithms. Outline the basic algorithm for each. [8 Marks]

QUESTION THREE (20 MARKS)

- a) Describe the benefits of a mono-programming operating system. [4 Marks]
- b) Describe the general strategy behind *deadlock prevention*, and give an example of a practical deadlock prevention method. [4 Marks]
- c) Compare bitmap-based allocation of blocks on disk with a free block list. [4 Marks]
- d) Identify four security concerns for a computer system for a bank. For each item on your list, state whether this concern relates to physical security, human security, or operating system security. [4 Marks]
- e) Explain the elements of the process control table/block [4 Marks]

QUESTION FOUR (20 MARKS)

- a) Highlight two advantages and two disadvantages of user-level threads. [4 Marks]
- b) After a process has been created, it does its job to completion. This process is then terminated immediately or later. Outline the conditions that may lead to the termination of process. [4 Marks]
- c) Describe the four memory allocation algorithms. [4 Marks]
- d) Consider the following table showing part of the execution of five processes.

Process	Arrival Time	Burst Time
p ₁	0	3
p ₂	1	5
p ₃	3	2
p ₄	9	5
P ₅	12	5

Draw a Gantt chart to show the scheduling of these processes using the following algorithms.

- i) Round Robin

[2 Marks]

- ii) Shortest Remaining Time [2 Marks]

- e) What is the average turnaround time and average waiting time using the two algorithms? [4 Marks]

QUESTION FIVE (20 MARKS)

- a) Describe the **five state process model**, describe what transitions are valid between the five states. [10 Marks]
- b) Describe the difference between *external* and *internal* fragmentation. Indicate which of the two are most likely to be an issues on;

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- i) A simple memory management machine using base limit registers and static partitioning,
and
 - ii) A similar machine using dynamic partitioning. [6 Marks]
- c) Distinguish between preemptive scheduling and non-preemptive scheduling? [4 Marks]
What is the issue with the latter?
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