



MACHAKOS UNIVERSITY

University Examinations for 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 107/SIT 121: OPERATING SYSTEM

DATE: 13/4/2023

TIME: 8:30 – 10:30 AM

Instructions

This Paper consists of FIVE questions

Answer question ONE and any other TWO questions in this paper

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain the following terminologies as used with operating system (10 marks)
- i) Segmentation
 - ii) Paging
 - iii) Fragmentation
 - iv) Swapping
 - v) Starvation
- b) Discuss **three** functions played by operating system (6marks)
- c) Differentiate between contiguous and non-contiguous memory allocation. (4 marks)
- d) Use the following process scheduling table to calculate average waiting time using
- i) FCFS (5 marks)
 - ii) SJN (5 marks)

Process	Arrival Time	Execute Time	Priority	Service Time
P0	0	5	1	9
P1	1	3	2	6
P2	2	8	1	14
P3	3	6	3	0

QUESTION TWO (20 MARKS).

- a) i) Outline THREE ways of accessing Files in operating systems (3 marks)
ii) State THREE main ways operating system uses to allocate disk space to files. (3 marks)
- b) Explain any FOUR ways of Recovering from a deadlock condition (8 marks)
- c) Explain the following terminologies as used with operating systems (6 marks)
- i. Pooling
 - ii. Direct memory access(DMA)
 - iii. Program status register

QUESTION THREE (20 MARKS)

- a) Using a well labeled diagram explain events that might occur when the process is allocated to the CPU and is executing. (9 marks)
- b) Explain any FIVE ways of optimizing scheduling criteria in processes (5 marks)
- c) While preventing deadlock from happening, explain how the hold and wait condition can be eliminated. (2 marks)
- d) With reference to variable partition, discuss any **two** techniques which can be employed by Operating System to handle external Fragmentation. (4 marks)

QUESTION FOUR (20 MARKS)

- (a) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
p4	1	4
P5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

- i) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling. (4 marks)
- ii) Calculate the waiting time of each process for each of the scheduling algorithms in part a? (8 marks)
- b) Highlight any **two** reasons that would cause an executing process to terminate. (2 marks)
- c) Explain three goals of operating system security. (6 marks)

QUESTION FIVE (20 MARKS)

- a) With the help of a diagram, explain the various process states. (6 marks)
- b) Operating system employs a number of strategies to determine where to place incoming process. Critically discuss any two memory placement strategies that can be employed to achieve this. (4 marks)
- c) Priority scheduling algorithm is both pre-emptive and non-pre-emptive. Explain how this is achieved. (4 marks)
- d) Critically discuss any three page replacement techniques used by operating system to determine which page needs to be allocated. (6 marks)