



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS COMPUTER SCIENCE)

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

SCO 107: OPERATING SYSTEM

DATE: 26/11/2020

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer question ONE and any other TWO questions.

QUESTION ONE (COMPULSORY)

- a) Explain the following terminologies as used with operating system (10 marks)
- i. Segmentation
 - ii. Paging
 - iii. Fragmentation
 - iv. Process
 - v. Swapping
 - vi. Program counter
 - vii. Dispatch latency
 - viii. Starvation
 - ix. PCB
 - x. Interrupt
- b) Discuss any **two** roles played by operating system while implementing the following functions associated with computer-based systems.
- i. File management (2 marks)
 - ii. Processor Management (2 marks)
 - iii. Main Memory Management (2 marks)
- c) Differentiate between contiguous and non-contiguous memory allocation. (4 marks)

- d) Use the process scheduling table below to calculate average waiting time using the algorithms below: (10 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

- i. FCFS
- ii. SJN
- iii. Priority Scheduling

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 occur when the process allocate 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. What is the waiting time of each process for each of the scheduling algorithms in part a? (4 marks)
 - iii. What is the turnaround time of each process for each of the scheduling algorithms in part a? (4 marks)
 - iv. Which of the schedules in part a results in the minimal average waiting time (over all processes)? (1 mark)
- b) Highlight any **three** reasons that would cause an executing process to terminate. (3 marks)
- c) Explain operating system security. (4 marks)

QUESTION FIVE (20 MARKS)

- a) With the help of a diagram, explain the various process states. (8 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) Assuming a 2 kb page size and the virtual page 2 is mapped onto the physical page frame 4, identify the physical address which will be accessed when a program tries to access address 5002. (4 marks)