



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

SCO 107: OPERATING SYSTEMS

DATE:

TIME:

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Define the following terminologies as used with Operating system (5 marks)
- Process,
 - Process state,
 - Dispatcher,
 - Dispatch latency,
 - Interrupt
- b) Explain any THREE conditions in which CPU scheduling decisions may take place in a process (3 marks)
- c) Briefly explain any FOUR scheduling criteria in a process (4 marks)
- d) Using First-Come, First-Served (FCFS) Scheduling algorithm, calculate average waiting time for the processes (3 marks)
- | Process | Burst Time (<i>milliseconds</i>) |
|---------|------------------------------------|
| P_1 | 24 |
| P_2 | 3 |
| P_3 | 3 |
- Suppose that the processes arrive in the order: P_1, P_2, P_3
- e) Explain any TWO ways operating system uses to authenticate users (4 marks)
- f) State TWO advantages and TWO disadvantages of demand paging as used in operating system virtual memory. (4 marks)

- g) Explain services provided by Kernel I/O subsystems in relation to operating system I/O software (4 marks)
- h) Explain the following terminologies as used with operating systems (3 marks)
- i. Pooling
 - ii. Direct memory access(DMA)
 - iii. Program status register

QUESTION TWO (20 MARKS)

- a) Discuss any **two** roles played by operating system while implementing the following functions associated with computer based systems.
- (i) Programs and subroutines loading (2 marks)
 - (ii) Processor Management (2 marks)
 - (iii) Main Memory Management (2 marks)
- b) Describe any **three** reasons that would cause an executing process to terminate. (6 marks)
- c) Explain how priority scheduling algorithm deals with the problem of starvation on processes with lower priority. (2 marks)
- d) Suppose we have 4 processes that arrived in the order P1,P2,P3,P4 and their burst times is as provided.

Process	Arrival Time	Burst Time
P1	0	5
P2	2	8
P3	3	4
P4	4	1

Considering the First Come First Served (FCFS) scheduling algorithm,

- (i) Draw the Ghant chart; (2 marks)
- (ii) Calculate the average waiting time for the processes; (2 marks)
- (iii) Calculate the average turn around time. (2 marks)

QUESTION THREE (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) Using Round Robin scheduling criteria with time quantum = 20, draw a Gantt chart and calculate the average waiting time for the processes (4 marks)

Process	Burst Time	Waiting Time of each Process
P_1	53	
P_2	17	
P_3	63	
P_4	26	

QUESTION FOUR (20 MARKS)

- a) 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
- b) Explain the following concepts as used with operating system memory management
- i. Segmentation
- ii. Paging
- iii. Fragmentation
- iv. Memory allocation
- v. Swapping (10 marks)

QUESTION FIVE (20 MARKS)

- a) Critically discuss any three page replacement techniques used by operating system to determine which page needs to be allocated. (6 marks)
- b) Each process which is executing in a system is represented by operating system using the Process Control Block(PCB). Discuss three major contents found in the PCB and their role. (6 marks)
- c) Critically discuss how the Round Robin (RR) scheduling algorithm works. (8 marks)