



# MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

BACHELOR OF SCIENCE (MATHEMATICS)

SCO 107: OPERATING SYSTEMS

DATE: 7/12/2020

TIME: 2:00 – 4:00 PM

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## INSTRUCTIONS

Answer question ONE and any other TWO questions.

### QUESTION ONE (30 MARKS)

- a) Define the following terminologies as used with Operating system (5 marks)
- i. Process,
  - ii. Process state,
  - iii. Dispatcher,
  - iv. Dispatch latency,
  - v. 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> )
<i>P1</i>	24
<i>P2</i>	3
<i>P3</i>	3

Suppose that the processes arrive in the order: *P1* , *P2* , *P3*

- 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 P3, P1, P4 and P2 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
P1	53	
P2	17	
P3	63	
P4	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 terminologies 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)