



# MACHAKOS UNIVERSITY

University Examinations for 2018/2019

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:

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## INSTRUCTIONS

Answer **question ONE** and any other **TWO** questions.

### QUESTION ONE (30 MARKS)

- a) Briefly explain the following operating system concepts
- i. Kernel (1 mark)
  - ii. Shell (1 mark)
  - iii. Swapping (1 mark)
  - iv. Direct Memory Access (DMA) (1 mark)
- b) Consider the following set of processes, with the length of the CPU burst given in milliseconds:

| Process | Burst Time | Priority |
|---------|------------|----------|
| P1      | 10         | 3        |
| P2      | 1          | 1        |
| P3      | 2          | 5        |
| 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. Distinguish between preemptive and non-preemptive scheduling algorithms as used in process management. (4 marks)
- ii. Briefly explain the following process scheduling algorithms: (4 marks)

- First Come First Served (FCFS).
  - Shortest Job First (SJF).
  - Priority Scheduling
  - Round Robin (RR)
- i. Draw the Gantt charts that illustrate the execution of these processes using the following algorithms: FCFS, SJF (non-preemptive), priority (a smaller priority number implies a higher priority) and RR (with quantum=1). (4 marks)
  - ii. What is the turnaround time of each process for each of the scheduling algorithms? (4 marks)
- c) Briefly explain three categories of operating systems (6 marks)
  - d) Describe two security authentication mechanisms in operating systems (4 marks)

### QUESTION TWO (20 MARKS)

- a) Describe three page replacement algorithms. (6 marks)
- b) Briefly explain four major functions of O.S Kernel in process management (4 marks)
- c) Explain the difference between the following sets of operating system terminologies.
  - i. Process and thread
  - ii. System call and interrupt (4 marks)
- d) With the aid of a diagram, describe the process model, clearly explaining the states, what transitions are valid between the states, as well as events that might cause such transitions. (6 marks)

### QUESTION THREE (20 MARKS)

- a) Operating systems exist in different structures that have been tried over time, so as to provide a spectrum of possibilities. Discuss any three such operating system structures. (6 marks)
- b) Describe four approaches of eliminating race conditions by mutual exclusion (6 marks)
- c) Highlight four principles of I/O software (4 marks)
- d) Explain two general approaches to memory management. (4 marks)

### QUESTION FOUR (20 MARKS)

- a) Explain the following memory allocation schemes

- i. Contiguous allocation (2 marks)
- ii. Segmentation (2 marks)
- b) Discuss four services provided by the Operating System (4 marks)
- c) Describe four different strategies that can be used in overcoming deadlock. (8 marks)
- d) In memory management, several algorithms can be used to dynamically allocate memory in existing holes for a newly created or existing process being swapped in from disk. Briefly explain three such algorithms. (4 marks)

**QUESTION FIVE (20 MARKS)**

- a) Explain four difficulties with Concurrency. (4 marks)
- b) Explain three sources of interrupts in Operating systems (6 marks)
- c) Discuss any four such criteria used for this comparison of scheduling algorithms to ensure CPU optimization (8 marks)
- d) Explain how the producer-consumer problem is relevant to operating system I/O. (2 marks)