

2920/105

OPERATING SYSTEMS

July 2018

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

OPERATING SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **EIGHT** questions.*

*Answer any **FIVE** of the **EIGHT** questions in the answer booklet provided.*

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) Explain **two** functions of the *command processor* as applied in operating systems. (4 marks)
 - (b) Differentiate between *long term* and *medium term* process schedulers of an operating system. (4 marks)
 - (c) Jessica intends to prepare lecture notes on the conditions that must hold for deadlocks to occur during **inter process communication**. Explain **four** conditions that she could include in the notes.
mutual exclusion, hold and wait, circular wait, no preemption (8 marks)
 - (d) With the aid of a diagram, describe *paging memory* allocation technique. (4 marks)
2. (a) Explain each of the following as applied in operating systems:
 - (i) overlay;
 - (ii) pipe. (4 marks)
 - (b) Differentiate between *quick disk format* and *full disk format* as applied in operating systems. (4 marks)
 - (c) With the aid of a diagram, describe the *process control block* as used in process management.
identify free, stack, priority (6 marks)
 - (d) Robert, a database manager has been tasked to create a report on directory structures. Explain **three** types of such structures that he could include in the report. (6 marks)
3. (a) Define each of the following terms as used in process scheduling:
 - (i) dispatch latency;
 - (ii) turnaround time;
 - (iii) throughput. (6 marks)
 - (b) Differentiate between *semaphore* and *interface metaphor* as used in operating systems. (4 marks)
 - (c) Explain **three** functions of the *system clock* as used in computer systems. (6 marks)
 - (d) Figure 1 shows a type of file organization. Use it to answer the questions that follow.

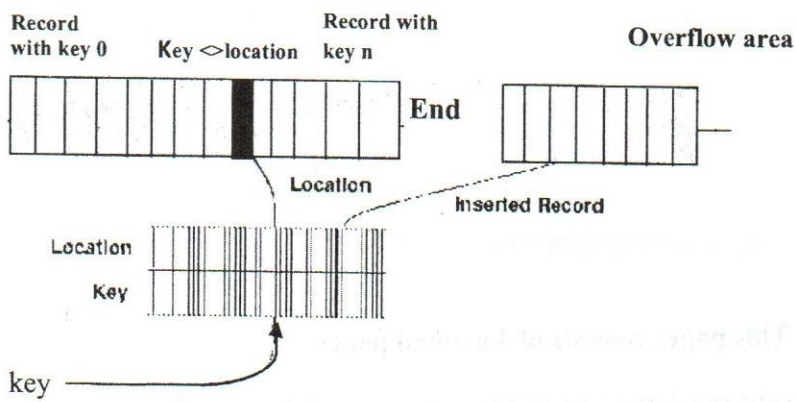


Figure 1

- (i) Identify the type of file organization represented in figure 1; (1 mark)
- (ii) Outline **three** advantages of the file organization identified in (i). (3 marks)

4. (a) (i) Outline **four** advantages of *virtual memory* in a computer system. (4 marks)
- (ii) Distinguish between *synchronous* and *asynchronous I/O* modes of operation in an operating system. (4 marks)
- (b) With the aid of a diagram, describe the *layered* structure of an operating system. (6 marks)
- (c) With the aid of a diagram, describe *thrashing* as applied in memory management. (6 marks)

5. (a) (i) Outline **four** operations that an operating system could perform on a file. (4 marks)
- (ii) Explain the term *polling* as used in process management. (2 marks)
- (b) Describe each of the following file allocation schemes:
- (i) Contiguous Allocation;
 - (ii) Linked List Allocation;
- (c) *Redundant array of independent disks* is one of the techniques of disk management. Explain **two** advantages of this technique in a computer system. (4 marks)
- (d) The operating system provides security in a multiuser environment. Explain **three** ways in which the operating system implements this function. (6 marks)

6. (a) Outline **four** advantages of a client-server operating system. (4 marks)
- (b) Differentiate between *global replacement* and *local replacement* as applied in memory management. (4 marks)
- (c) Explain a circumstance where the operating system applies each of the following memory allocation techniques:
- (i) first fit;
 - (ii) best fit;
 - (iii) worst fit.
- (d) With the aid of a diagram describe NT file system of an operating system. (6 marks)

7. (a) Outline **two** disadvantages of *batch mode of processing* supported by an operating system. (4 marks)
- (b) With the aid of a diagram describe a *three process state model*. (5 marks)
- (c) Explain a circumstance under which each of the following types of interrupts could be applied:
- (i) maskable;
 - (ii) non maskable.
- (4 marks)

- (d) Table 1 shows different processes and their respective burst times during inter-process communication. Use it to answer the questions that follow.

Process	Burst Time
P1	32
P2	6
P3	9
P4	12

Table 1

Suppose the processes arrive at time 0 in the order P2, P4, P1, and P3 respectively. Calculate:

- (i) the *average waiting time* assuming the *first in first out* scheduling algorithm. (3 marks)
- (ii) the *average waiting time* assuming a *non-preemptive short job first* scheduling algorithm. (4 marks)

8. (a) Explain each of the following terms as used in operating systems:

- (i) trap;
- (ii) relocating loader;
- (iii) swapping. (6 marks)

- (b) State **four** examples of *read only memory* in a computer system. (4 marks)

- (c) Assume that a disk has 50 cylinders with an initial request on cylinder 7. The disk receives new requests for cylinder 1, 30, 12, 26, 4 and 6 respectively. Graphically represent the scenario using each of the following disk scheduling algorithms:

- (i) Shortest Seek First (SSF);
- (ii) First Come First Served (FCFS);
- (iii) SCAN assuming the head moves towards 0. (6 marks)

- (d) Distinguish between *disk drive* and *device driver* as applied in computer systems. (4 marks)

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