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.

(b) Differentiate between *long term* and *medium term* process schedulers of an operating system.

(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.

(d) With the aid of a diagram, describe *paging memory* allocation technique.

2. (a) Explain each of the following as applied in operating systems:
   (i) overlay;
   (ii) pipe.

(b) Differentiate between *quick disk format* and *full disk format* as applied in operating systems.

(c) With the aid of a diagram, describe the *process control block* as used in process management.

(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.

3. (a) Define each of the following terms as used in process scheduling:
   (i) dispatch latency;
   (ii) turnaround time;
   (iii) throughput.

(b) Differentiate between *semaphore* and *interface metaphor* as used in operating systems.

(c) Explain three functions of the *system clock* as used in computer systems.

(d) Figure 1 shows a type of file organization. Use it to answer the questions that follow.

![Diagram of file organization](image-url)
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; (4 marks)
(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; (6 marks)
(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; (4 marks)
(ii) non maskable.
(d) Table 1 shows different processes and their respective burst times during inter-process communication. Use it to answer the questions that follow.

<table>
<thead>
<tr>
<th>Process</th>
<th>Burst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>32</td>
</tr>
<tr>
<td>P2</td>
<td>6</td>
</tr>
<tr>
<td>P3</td>
<td>9</td>
</tr>
<tr>
<td>P4</td>
<td>12</td>
</tr>
</tbody>
</table>

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)