2920/105
OPERATING SYSTEMS
July 2011
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

OPERATING SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet.

*Answer **FIVE** of the following **EIGHT** questions.*
All questions carry equal marks.

This paper consists 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) (i) Explain **two** objectives of operating systems in computers. (4 marks)

(ii) Outline **two** typical characteristics of 3rd generation operating systems. (2 marks)

(b) Describe **four** circumstances under which a running process can be terminated by an operating system. (8 marks)

(c) Distinguish between *fixed* and *dynamic* partitioning in terms of *strengths* and *weaknesses* as used in memory management. (3 marks)

(d) Draw a diagram of a typical *disk layout* showing tracks, sectors, intersector gaps and intertrack gaps . (3 marks)

2. (a) Outline **two** typical components of *file access information*. (2 marks)

(b) Differentiate between *reserved* and *committed* pages as used in virtual memory management. (3 marks)

(c) The management at Yewite Company Ltd. intends to install a multiprocessor system in the organization.

(i) Describe **two** types of multiprocessor systems the company can install. (4 marks)

(ii) Outline **two** advantages of the system. (2 marks)

(d) (i) Tom, a software engineer, would like to design an operating system for a *multi-level process scheduling* system. Outline **four** parameters he should consider to guarantee efficiency in the system. (4 marks)

Table 1 shows four processes with their corresponding *arrival* and *service* times in a particular system. Use it to answer the question that follows.

Process	Arrival time	Service time (sec)
A	0	1
B	1	9
C	2	1
D	3	6

Table 1

Assuming SRTN process *scheduling algorithm*, determine the *average turn-around* time for the system. (5 marks)

3. (a) Explain the following terms as used in operating systems:

(i) process control block;

(ii) monolithic system. (4 marks)

(b) Outline **four** basic *operations* associated with a change in the state of a process. (4 marks)

(c) Differentiate between *block-oriented* and *stream-oriented* I/O devices. (4 marks)

(d) Processes A, B and C made a memory request for 100K, 256K and 64K respectively from a system that has 1MB as the *initial memory block*. With the aid of a *tree diagram*, describe the memory allocation for the requests assuming the *buddy system*. (8 marks)

4. (a) (i) Outline **two** policies that can be employed by an operating system during file allocation. (4 marks)

(ii) Explain **three** methods of *blocking* as used in file management. (6 marks)

(b) Distinguish between *logical* and *physical* memory organization as used in computers. (4 marks)

(c) Assuming a system that uses the DMA I/O technique, describe the process of reading a block of data from an I/O device. (6 marks)

5. (a) (i) State **two** advantages of *erasable optical disks* over *floppy disks*. (2 marks)

(ii) Explain the following terms as used in disk systems:

I. head;

II. density. (4 marks)

(b) Faisal Company Ltd. intends to procure an *interactive, general purpose file management system*. Outline **six** requirements that the system should meet. (6 marks)

(c) (i) A particular processing system that employs *round robin* scheduling algorithm uses a *short time slice*.
Explain **one** positive and **one** negative effect of the time slice to the processing. (4 marks)

(ii) Joseph, a data entry clerk, realized that all the active tasks on his computer system were *deadlocked*. Outline **four** approaches he could employ to recover from this situation. (4 marks)

6. (a) Distinguish between *wait* and *signal* operations as used in semaphores. (4 marks)

(b) (i) Explain the term *overlaying* as used in memory management. (2 marks)

(ii) Outline **four** advantages of *segmentation* as applied in memory management. (4 marks)

(c) A particular hard disk has a total of 200 tracks. Six processes make requests for data from the following tracks respectively:

55 58 39 18 90 160

For each of the following *disk scheduling algorithms*, determine the *average seek length* assuming that the starting track is 100.

(i) FIFO;

(ii) SSTF. (6 marks)

(d) (i) With the aid of a diagram, describe a *tree-structured* directory. (3 marks)

(ii) State **one** advantage of using a *tree-structured* directory. (1 mark)

7. (a) Explain the following terms as used in memory management:

(i) relative address;

(ii) thrashing. (4 marks)

(b) (i) Outline **three** typical characteristics of RAID systems. (3 marks)

(ii) With the aid of a diagram, describe a typical organization of I/O subsystem. (7 marks)

(c) Vicky, a system administrator, would like to define the access rights for her company's database. Explain **three** categories of users she is likely to consider. (6 marks)

8. (a) A memory management system should determine when a modified page should be written out to the secondary memory.

(i) Identify the *policy* concerned with this task. (1 mark)

(ii) Outline **two** types of the policy identified in (i) that are applied in memory management systems. (3 marks)

(b) (i) State **four** *free space management* techniques used in file management. (2 marks)

(ii) Fridah, a programmer, intends to design a file management system for her company. Outline **four** objectives that the system should meet. (4 marks)

(c) (i) Distinguish between *programmed* I/O and *interrupt-driven* I/O. (4 marks)

(ii) Vivian, a computer technician, intends to install a new hard disk in a laptop. Describe **three** activities that she would carry out. (6 marks)

(b) Explain the following terms as used in process management:

(i) Spawning;

(ii) Starvation. (4 marks)

(c) Using a well labeled diagram, describe the following as applied in process management:

(i) blocked suspended;

(ii) ready suspended. (8 marks)

(d) With reference to *linked list* file allocation, illustrate the parts of a data block. (2 marks)

3. (a) (i) State the name given to each of the following computer Keyboard characters.

I. &

II. •

III. ^

IV. |

(2 marks)

(ii) Outline **two** challenges in the use of command based operating systems. (2 marks)

(b) A computer technician bought a TFT monitor, and along with the device, she was given an accompanying software in a CD ROM.

(i) Identify the software contained in the CD ROM.

(ii) Explain the purpose of the software identified in (i). (3 marks)

(c) (i) Explain the function of each of the layers 0, 2 and 4 in a layered operating system structure. (3 marks)

(ii) Explain **two** disadvantages of an operating system which uses fixed length record file structure. (4 marks)

(d) (i) With the aid of a well labeled diagram, describe a *tree topology*. (4 marks)

(ii) Explain **two** factors that determine a *block size* in operating system. (2 marks)

4. (a) Distinguish between an *Uninterruptible Power Supply* and a *surge protector*. (4 marks)

(b) State **two** benefits of installing a *computer network*. (2 marks)

(d) Describe **two** roles of each of the following computer specialists:

(i) data manager;

(ii) data control clerk. (4 marks)

6. (a) Outline **four** characteristics of distributed operating system. (4 marks)

(b) Figure 1 shows a sub menu of an operating system. Explain the function of each of the features labeled (i) and (ii). (4 marks)

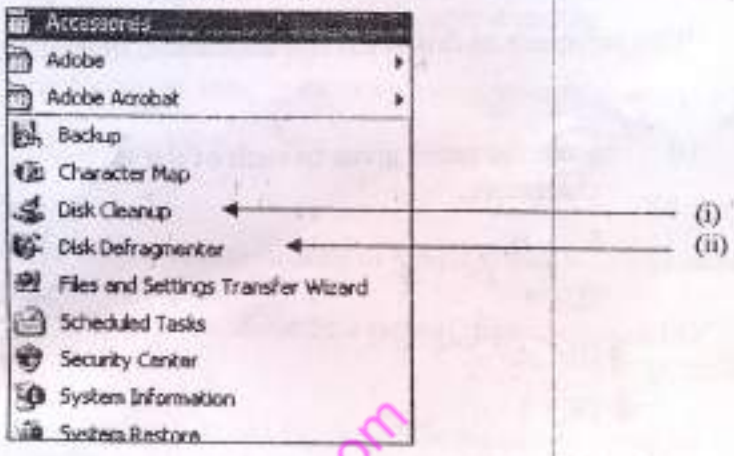

Figure 1

(c) (i) Describe a *Combo drive* as used in computers. (2 marks)

(ii) Explain each of the following terminologies as used in deadlocks:

I. semaphores;

II. monitors. (4 marks)

(d) (i) Disk requests arrived in the disk controller for the cylinders 10, 22, 27, 2, 40, 6 and 36 in that order. A seek takes 6 ms per cylinder moved. Assuming the arm is initially at cylinder 20, determine the total seek time required when using:

I. FCFS; (2 marks)

II. elevator algorithm assuming that the arm is moving towards the inner cylinders. (3 marks)

(ii) Identify the most efficient method in d(i). (1 mark)

7. (a) (i) Using a well labeled diagram, describe Round Robin process scheduling algorithm. (4 marks)

(ii) State **two** advantages of virtual devices. (2 marks)

(b) (i) Distinguish between a *pit* and a *land* as applied in compact disks. (4 marks)

(ii) State **two** network operating systems from different families. (1 mark)

(c) (i) Sketch the directory structure represented by the following pathnames:

C:\Principal\deputy Principal\Registrar\results.doc.

C:\Principal\deputy Principal\Dean\Leaving Certificate.doc.

C:\Principal\deputy Principal\Bursar\feestatement.doc. (3 marks)

(ii) State **two** advantages of using directories in a computer system. (2 marks)

(d) With the aid of a well labeled diagram, explain each of the following terms as used in disk space management:

(i) master Boot record;

(ii) partition table. (4 marks)

8. (a) (i) State **four** memory allocation techniques. (2 marks)

(ii) The following are process scheduling schemes:

- first come first served;- Non-preemptive
- shortest job first; - Non-preemptive
- multileveled feedback queue;- Non preemptive
- shortest-remaining time;- preemptive

Classify them as either *pre-emptive* or *non pre-emptive*. (2 marks)

(iii) Explain the application of *Bluetooth* technology in computing. (2 marks)

(b) (i) State **two** health problems that can be caused by a flickering monitor. — Eye problems — Headaches (1mark)

(ii) Explain **two** areas where a *daemon* process can be used. (4 marks)

(c) (i) With the aid of a sketch, describe the concept of *memory mapped-terminals*. (4 marks)

(ii) Compare *magnetic tape* and *hard disk* in terms of:

I. speed of retrieval; -

II. storage density. hard disk has high storage density (1 mark)

(d) Explain the following terms as used in I/O software:

(i) synchronous transfer; Parallel Sends a group of characters at time

(ii) asynchronous transfer. Serial send one character at a time (4 marks)

1. (a) State **four** characteristics of a typical mainframe computer. (2 marks)

(b) (i) Compare CRT and LCD monitors in terms of technology used. (2 marks)

(ii) List **two** events that may lead to each of the following:

I. Process creation;

II. Process termination (4 marks)

(c) (i) A certain computer has the following drives:

- 1 compact disk;
- 2 floppy diskette;
- 1 physical hard disk;
- 2 logical drives;
- 2 USB flash memories already plugged-in.

State the volume labels that would be assigned to each of the drives by the computer system. (4 marks)

(ii) Explain the principle used in storing information on a flash memory. (2 marks)

(d) (i) Table 1 shows details of processes in a particular system. Use it to answer the questions that follow.

Process name	Run Time(minutes)	Time waiting(minutes)
A	50	5
B	10	5
C	35	5

Table 1

I Assuming *Highest Response Ratio Next* scheduling algorithm, calculate the priority value for each process. (3 marks)

II Determine the process to be executed first. (1 mark)

(ii) Explain **two** advantages of NTFS file system. (2 marks)

2. (a) (i) Outline **two** shortcomings of first generation computers. (2 marks)

(ii) High Technology Company Limited has listed the following software in its brochure: Lotus AmiPro, Ms-Excel, Loader, Lotus Approach, Lotus 1-2-3, Ms-Access, Word Perfect and Disk Manager.
Classify the software as:

I. utility programs;

II. spreadsheets;

III. databases;

IV. word processors. (4 marks)