

Name \_\_\_\_\_ Index No. \_\_\_\_\_

2920/105  
OPERATING SYSTEMS  
July 2013  
Time: 3 hours

Candidate's Signature \_\_\_\_\_

Date \_\_\_\_\_



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY**  
**MODULE I**

**OPERATING SYSTEMS**

**3 hours**

**INSTRUCTIONS TO CANDIDATES:**

*Write your name and index number in the spaces provided above.*

*Sign and write the date of examination in the spaces provided above.*

*Answer any FIVE questions of the following EIGHT questions on the spaces provide on the question paper.*

*All questions carry equal marks.*

**For Examiners' Use Only**

Questions	1	2	3	4	5	6	7	8	Total Marks
Marks									

**This paper consists of 14 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 each of the following terms as used in memory management:

(i) caching; (2 marks)

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(ii) trashing. (2 marks)

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(b) Two processes A and B are to be executed in a uni-processor computer. When one of the processes is being executed the other cannot proceed because of common set of data.

(i) Describe the section of memory depicted in the scenario. (3 marks)

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(ii) A student observed that each time the processes were executed, different results were produced. Describe the condition that could lead to this observation. (3 marks)

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(c) With the aid of a diagram, describe the *two-level directory* logical structure. (4 marks)

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- (d) (i) Outline **two** functions of the *clock software* as used in operating systems. (2 marks)

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- (ii) Differentiate between *dumb* and *intelligent* terminal as used in computer hardware. (4 marks)

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

- (i) time sharing; (1 mark)

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- (ii) system call; (1 mark)

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- (iii) thread. (1 mark)

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- (b) A hard disk with 255 tracks received requests from the disk controller for data in tracks 40, 67, 11, 240 and 87 in that order respectively. Assuming the head is currently located at track 45.

- (i) Sketch the order in which *C-SCAN* scheduling algorithm will service the requests. (4 marks)

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- (ii) Determine the total seek distance in (i). (2 marks)

- (c) Two processes P1 and P2 are running in a CPU as outlined:
- P1 requests for a resource R1 and P2 requests for a resource R2. Both the resources are available and they are allocated to the requesting process.
  - Later process P1 requests for R2 held by P2 and P2 requests for R1 held by P1.

- (i) Draw a resource allocation graph to represent this scenario. (4 marks)

- (ii) State the condition depicted by the graph in (i). (1 mark)

- (d) A student created a file in her new computer to store project work.

- (i) Outline **four** file attributes that could be incorporated in the file. (2 marks)

- (ii) State **two** mechanisms that she could use to protect the file against unauthorized access. (2 marks)

- (iii) The student shares the computer with two of her colleagues. Explain a tool that could be used to monitor the computer usage. (2 marks)

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3. (a) Outline **four** technical factors that should be considered when choosing I/O devices. (4 marks)

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- (b) Explain the effect of *buffering* on the performance of each of the following devices:

(i) mouse; (2 marks)

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(ii) graphic card. (2 marks)

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- (c) Explain each of the following file organization techniques.

(i) sequential; (2 marks)

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(ii) random. (2 marks)

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- (d) (i) Distinguish between *layered* and *client/server* Operating System structures. (4 marks)

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- (ii) Most multiprogrammed systems are designed such that user programs access memory through virtual addresses and the operating system through physical addresses. Explain **two** implications of this design on the initiation of I/O operations by the user program. (4 marks)

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4. (a) Outline **four** file operations used in file management. (4 marks)

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- (b) Explain each of the following terms as used in memory management

- (i) swapping; (2 marks)

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- (ii) overlaying; (2 marks)

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- (iii) paging. (2 marks)

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- (c) With the aid of a diagram, describe the structure of I/O software. (6 marks)

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- (d) Two processes enter the ready queue of a system with the following properties:

- **Process 1** needs 8 units of CPU time but after every 2 units, it must perform an I/O. Assume that there is no work to be done following the last I/O operation.
- **Process 2** needs 20 units of CPU time and it process arrives just after Process 1.

Using *Round Robin* scheduling algorithm with a time slice of 4 units;

- (i) Draw a Gantt chart showing the execution of the two processes. (3 marks)

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- (ii) Determine the completion time for each process. (1 mark)

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5. (a) Describe each of the following memory allocation techniques:

- (i) dynamic partitioning; (2 marks)

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(ii) segmentation. (2 marks)

(b) Joseph would like to replace his computer card reader with a newer version.

(i) Identify a principle in I/O device management that could enable him carry out this task without the programs using it. (1 mark)

(ii) Explain the implementation of the principle identified in (i). (3 marks)

(c) Explain the effect of each of the following on CPU utilization:

(i) increase main memory capacity; (2 marks)

(ii) spooling. (2 marks)

(d) (i) Recently, John has realized that his personal computer keeps displaying the message '*your system is getting low on virtual memory*'. Describe **two** ways that he could use to rectify the problem. (4 marks)



(ii) Differentiate between *logical* and *physical* file systems. (4 marks)

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6. (a) (i) Outline **three** advantages of coding operating system programs in a high-level language. (3 marks)

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(ii) State **three** types of *fifth generation* operating systems. (3 marks)

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(b) Describe **two** performance overheads associated with servicing an interrupt. (4 marks)

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(c) Assume a memory management technique of fixed partitions in order of 100K, 500K, 300K and 200K. Four processes of 417K, 195K, 112K and 96K need to be loaded to the memory. Allocate the processes using each of the following placement policies:

(i) Best Fit; (2 marks)

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(ii) First Fit. (2 marks)

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- (b) Differentiate between *semaphore* and *monitor* as used in process management. (4 marks)

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- (c) (i) Citing an example in each case, distinguish between *reusable* and *consumable* resources as used in operating systems. (4 marks)

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- (ii) ABC Ltd Company has recently installed Internet in its premises. Explain **two** methods it could use to protect computer systems from computer worms. (4 marks)

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- (d) Employees in a certain company using personal computers connected to a central server have realized that the response time of the server reduces with the increase of the number of users.

- (i) Identify **two** techniques that could be used to solve this problem. (2 marks)

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- (ii) The company has enforced security mechanisms to protect the shared data. Differentiate between the term *security* and *protection*. (2 marks)

8. (a) (i) Define the term *disk sector sparing* as used in computer hard disk. (2 marks)

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(ii) Explain each of the following terms as used in computer magnetic disk:  
(I) platter; (1 mark)

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(II) rotational delay; (1 mark)

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(III) transfer time. (1 mark)

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(b) (i) Differentiate between *internal* and *external* fragmentation as used in memory management. (4 marks)

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(ii) Consider each of the following process scheduling algorithms: (2 marks)

First come First Served, Last In First Out, Shortest Job First, and Shortest Job First

Classify each of the algorithms as either *preemptive* or *non-preemptive*.

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- (c) A certain college has campuses in several towns. Each campus meets its own computational needs but submits a report to the main campus on a daily basis.
- (i) Identify the appropriate Operating System to be used at the main campus. (1 mark)

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- (ii) Explain **two** characteristics of the Operating System identified in (i). (4 marks)

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- (d) Figure 2 shows functions of a file management system. Use it to answer the question that follows.

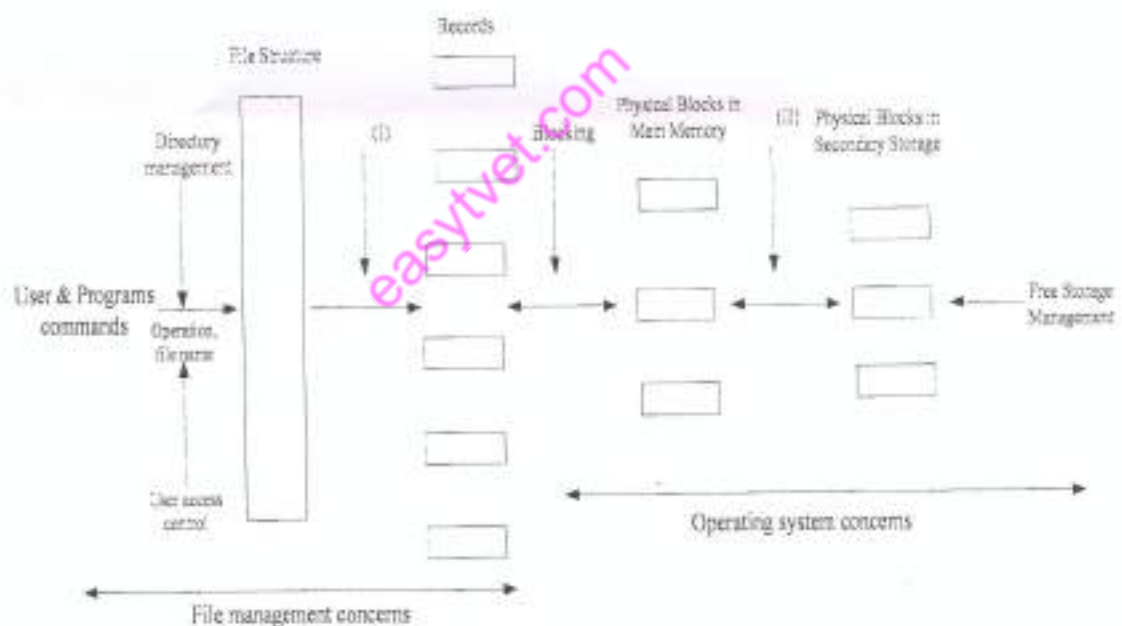


Figure 2

Explain each of the process labeled (I) and (II).

(4 marks)

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