1920/106
OPERATING SYSTEMS
July 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MODULE I

OPERATING SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of TWO sections: A and B.
Answer ALL the questions in section A and any FIVE from section B 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.

SECTION A (40 marks)

Answer ALL the questions in this section.

1. The following is a list of examples of operating systems;
MS-Windows, early version of UNIX, MS-DOS, DOS shell, Linux and *Mac OS.*
Group each operating system according to the type of user interface. (4 marks)

2. Explain each of the following terms as used in operating systems:
(i) pipe;
(ii) mutex semaphore. (4 marks)

3. Outline **four** objectives of device I/O management. (4 marks)

4. The 3rd generation operating systems helped the computers to take advantage of available resources. Explain **two** other features that were evident during this generation. (4 marks)

5. With the aid of a diagram, describe the addresses used in segmentation to eliminate internal fragmentation. (4 marks)

6. Differentiate between *throughput* and *turn-around* process scheduling goals. (4 marks)

7. Janet, a system administrator, realised that one of the computers had a deadlock while undertaking processing. Outline **four** criteria that she could use to select a process to abort in order to recover from the deadlock. (4 marks)

8. Outline **four** parts of a hard disk. (4 marks)

9. Differentiate between *SCAN* and *C-SCAN* disk scheduling algorithms. (4 marks)

10. Describe each of the following terms as used in operating system:
(i) thread;
(ii) inter-process communication. (4 marks)

SECTION B (60 marks)

*Answer any **FOUR** questions from this section*

11. (a) Outline the purpose of each of the following as used in device I/O management:

(i) overlays; (1 mark)

(ii) mirroring; (1 mark)

(iii) hamming code. (1 mark)

(b) Explain **two** characteristics of a non-pre-emptive scheduler. (4 marks)

(c) With the aid of a diagram describe the **five** states of a process. (4 marks)

(d) Differentiate between the *early* and the *modern* operating systems by describing the file access method that is most appropriate for each. (4 marks)

12. (a) Outline **three** parameters that are considered when selecting a scheduling algorithm. (3 marks)

(b) With the aid of a diagram, explain the workings of a cache memory in a computer system. (4 marks)

(c) A process request 13kB of memory and the memory manager currently has a list of unallocated blocks of 7kB, 15kB, 20kB, 11kB and 14kB. With the aid of a diagram show:

(i) best fit strategy. (2 marks)

(ii) first fit strategy. (2 marks)

(d) A student created a file in a computer. Outline **four** ways in which this file could be structured. (4 marks)

13. (a) State **six** system calls for managing directories. (3 marks)

(b) Alice uses the File Allocation Table (FAT) file system in her computer:

(i) outline **two** features of this file system; (2 marks)

(ii) explain **one** security concern of this file system. (2 marks)

(c) Differentiate between *cache hit* and *cache miss* as used in device I/O management. (4 marks)

(d) With the aid of a diagram, describe the interrupt driven I/O communication protocol when a processor issues an I/O command. (4 marks)

14. (a) State **three** components of programmable clocks. (3 marks)

(b) Explain **one** item required by the banker's algorithm approach for deadlock prevention. (2 marks)

(c) A disk rotates at a constant speed in a computer system. Describe **three** components that are used when selecting a track of such a disk. (6 marks)

(d) The following are queues; 94,180,35,118,124,62 and 68 with the read write head initially at track 40 and the tail track being at 185. Draw the First Come First Served (FCFS) algorithm for this disk scheduling. (4 marks)

15. (a) Outline **three** circumstances that lead to mutual exclusion of processes during process management. (3 marks)

(b) Explain **two** system messages used by the clock software in a computer system. (4 marks)

(c) Janet intends to transfer data between a low-speed device and a high-speed device in her computer system:

(i) Describe the most appropriate technique that she could use to transfer the data. Spooling. (2 marks)

(ii) Outline **two** advantages of the technique in (i). (2 marks)

(d) Alex would like to have efficient disk space utilization for file allocation. Describe **two** methods that he could use. (4 marks)

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