



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: 80BSAN: Bachelor of IT: Systems Administration and Networks 07BACS: Bachelor of Computer Science: Systems Administration; Communication Networks; Software Development	
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SECOND OPPORTUNITY / SUPPLEMENTARY EXAMINATION QUESTION PAPER	
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THIS QUESTION PAPER CONSISTS OF 6 PAGES
(Excluding this front page)

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. When answering questions you should be guided by the allocation of marks. Do not give too few or too many facts in your answers.

PERMISSIBLE MATERIALS

1. Non-programmable calculator

Section A [10 marks]

Question 1

Below are multiple choice questions as well as true / false questions. Select the correct answers. [10]

- 1.1 If the File Manager is required to provide detailed instructions for each system device (how to start it, get it to move to the correct place where the desired record is located, and when to stop), then the program is considered device dependent. True/False
- 1.2 When using DMA, the CPU controls the transfer of data to and from memory over the system bus. True/False
- 1.3 If locks are not used to preserve data integrity, the updated records in a database may include only some of the data—and their contents depend on the order in which each process finishes its execution. True/False
- 1.4 The segmented/demand paged memory allocation scheme is a combination of segmentation and demand paging, and it offers the logical benefits of segmentation, as well as the physical benefits of paging. True/False
- 1.5 CPU-bound jobs (such as printing a series of documents) have many brief CPU cycles and long I/O cycles. True/False
- 1.6 **Consider the printer event below:**
 - 1 P1 requests and is allocated the printer R1.
 - 2 P1 releases the printer R1.
 - 3 P2 requests and is allocated the disk drive R2.
 - 4 P2 releases the disk R2.
 - 5 P3 requests and is allocated the plotter R3.
 - 6 P3 releases the plotter R3.

Assume that the events above are occurring in the order given (1-6). Which of the following statements is true?

- a) Event 4 caused deadlock
- b) Event 5 caused deadlock
- c) Event 6 caused deadlock
- d) There is no deadlock

- 1.7 In a direct record organization scheme, the program used to store the data follows a set of instructions, called a ____ algorithm that transforms each key into a number, the record's logical address.
- a) Hashing
 - b) Grouping
 - c) Translation
 - d) lookup
- 1.8 The transition from ____ can be initiated by the Process Scheduler or the Job Scheduler.
- a) WAITING to READY
 - b) RUNNING to WAITING
 - c) RUNNING to FINISHED
 - d) HOLD to READY
- 1.9 In a paged memory allocation scheme, a page size that is too small will generate ____.
- a) excessive external fragmentation
 - b) excessive internal fragmentation
 - c) excessive page faults
 - d) very long Page Map Tables
- 1.10 In a relocatable dynamic partition scheme, the ____ contains a value that must be added to each address referenced in a program so that the system will be able to access the correct memory addresses after relocation.
- a) load register
 - b) relocation register
 - c) bounds register
 - d) compaction register

Section B [30 marks]

Question 2

2.1 Define the following terms as used in operation systems.

a) Data compression [2]

b) Multiprogramming [2]

2.2 Differentiate between turnaround time and response time. [4]

Question 3

3.1 What is the relationship between operating systems and computer hardware? [2]

3.2 What inconveniences can a user face while interacting with a computer system that has no operating system? [3]

Question 4

How does a page fault occur? Explain what happens / what needs to be done when a page fault has occurred. [4]

Question 5

5.1 One of the ways to utilize memory is to make use of compaction. Explain three circumstances (situations) when the operating system has to perform compaction. [3]

5.2 Discuss two advantages of performing compaction more often. [2]

Question 6

6.1 Explain two advantages of a paged memory allocation scheme and two advantages of a segmented memory allocation scheme. [4]

6.2 Explain two disadvantages of a paged memory allocation scheme and two disadvantages of a segmented memory allocation scheme. [4]

Section C [40 marks]

Question 7

You are given a program of size 8650 bytes that needs to be loaded in memory. Assume that you are using the paged memory allocation scheme and the size of each page frame is 650 bytes.

Answer the following questions given that 1 byte = 1 line of code:

- 7.1 How many pages will the program have? [2]
- 7.2 How much internal fragmentation will be caused? [2]
- 7.3 The processor (CPU), wants to access the instruction at line 6650. In which page number will it find this instruction and what will be the displacement (offset) value? [2]
- 7.4 What will be the line number for a line (instruction) on page 7 with a displacement of 400? [2]

Question 8

Given the table below, answer the questions that follow.

Job List:		Memory Block List:	
Job Number	Memory Requested	Memory Block	Memory Block Size
Job A	44K	Block 1	250K
Job B	220K	Block 2	900K
Job C	670K	Block 3	280K
Job D	64K	Block 4	200K
		Block 5	750K

(Assume all jobs are in a waiting queue in the order given)

Illustrate with an aid of a diagram how the jobs will be assigned in main memory using fixed partitions method:

Worst fit

[6]

Question 9

In demand paging, a page replacement policy is used to manage system resources. Suppose that a newly created process has 3 page frames (Frame X, Frame Y, Frame Z) allocated to it. The program has been divided into four pages (1, 2, 3, 4), and then generates the page references indicated below.

1 2 3 2 1 4 1 2 3 4 1 2 1 3 2 4

Assuming that all the three page frames are initially empty; use the Least Recently Used (LRU) page removal algorithm to do a page trace analysis. Indicate how many page faults would occur. [5]

Question 10

The system below uses the Banker's algorithm for deadlock avoidance. You are given that the system has 14 devices.

Job No.	Devices Allocated	Maximum Required	Remaining Needs
Job 1	3	6	
Job 2	5	7	
Job 3	0	13	
Job 4	4	15	

Answer the following questions:

- 10.1 Fill in the table for the remaining needs of the system [2]
- 10.2 Determine whether the system is in a safe or unsafe state. In case if you find out that it is unsafe, explain which jobs will be able to complete executing and which jobs will not be able to complete executing. If the system is in a safe state, list the sequence of requests and releases that will make it possible for all jobs to run to completion. [3]

Question 11

The device manager in an operating system is responsible for the management and scheduling of I/O requests. A device handler usually chooses which strategy to implement when handling I/O processes.

11.1 Given that it takes 1ms to travel from one track of a storage device to the next, and that the arm of a disk's Read/Write head is originally positioned at track 45 moving towards the higher numbered tracks. You are also given that the disk has tracks 0-249. Compute by illustrating how long it will take to satisfy the following requests:

50, 111, 87, 120, 215, 17, 30, using the following strategies (with zero rotational and transfer times):

a) LOOK [6]

b) C-SCAN [6]

11.2 What is the average seek time for each of the two strategies mentioned in 11.1.

a) LOOK [2]

b) C-SCAN [2]

End of Exam