NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION : Bachelor of Computer Science	
Bachelor of Computer Science in Cyber Security	
Bachelor of Informatics	
QUALIFICATION CODE: 07BCMS / 07BCCY / 07BAIT	LEVEL: 6
COURSE: Operating Systems	COURSE CODE: OPS611S
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DURATION: 3 hours	MARKS: 80

SECOND OPPORTUNITY /SUPPLEMENTARY EXAMINATION QUESTION PAPER	
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THIS QUESTION PAPER CONSISTS OF 7 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

Choose the correct answer from the multiple choice questions below.

1.1   The Job Scheduler seeks to _____ when scheduling jobs.

   a)   Run all CPU intensive jobs first
   b)   Run all I/O intense jobs first
   c)   Balance the CPU and I/O intensive jobs
   d)   Run the quickest jobs first

1.2   A system with _____ divides programs into parts and keep them in secondary storage, bringing each part into memory only as it is needed.

   a) Virtual Memory
   b) Shared Memory
   c) Paging processing
   d) Segmented processing

1.3   The concept of less-than-complete use of memory space in a fixed partition is called
       _____.

   a) fixed fragmentation
   b) internal fragmentation
   c) dynamic fragmentation
   d) external fragmentation

1.4   The Banker's Algorithm is an example of a(n) _____ policy

   a)   Avoidance
   b)   Recovery
   c)   Detection
   d)   Mutual exclusion

1.5 In a paged memory allocation scheme, a simple _____ has one entry for each page frame that shows its location and its free/busy status.

   a) Memory Map Table
   b) Memory Management table
   c) Page Access table
   d) Job Table

1.6 Assume that four jobs, E-H, require the CPU cycles listed below. Using the SJN algorithm, the average turnaround time is _____.

   Job: EFGH
   CPU cycle: 5 2 6 4

   a) 6.8
   b) 11.1
   c) 9.0
   d) 5.5

1.7 _____ is when, in modern printing systems, a disk accepts output from several users and acts as a temporary storage area for all output until the printer is ready to accept it.
   Select one:

   a) Lagging
   b) Spooning
   c) Spooling
   d) All of the above
   e)

1.8 _____ time is the time required to move the arm of a movable-head magnetic drive into position over the proper track.
   a) transfer
   b) access
   c) search
   d) seek

   1.9 Which of the following is not a function of the file manager
      a) File storage tracking
      b) File encryption
      c) File allocation if user access cleared
      d) File deallocation
      e) None of the above

1.10 Many computer users and some operating systems call sub-directories _____.

a) Databases
b) Folders
c) Volumes
d) Files

Section B [30 marks]

Question 2

Define the following terms as used in operating systems:
2.1   Aging [2]
2.2   Context Switching [2]
2.3   Concept starvation [2]

Question 3

Explain the fundamental differences between pre-emptive and non-preemptive scheduling

[4]

Question 4

Discuss the four (4) conditions that are required for a deadlock to occur. [8]

Question 5

5.1   File management is one of the sub-system managers of the operating systems. List any three (3) tasks that are performed by the mentioned sub-manager. [3]

5.2   List any three (3) items that can be found in a file descriptor table. [3]

Question 6

In a storage system consisting of conventional magnetic-media disks, several different delays occur when servicing a request. Identify at least three of these delays, and comment on their relative contribution to the total delay for servicing a request. [6]

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? [1]

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

For the system below, assume that all the devices are of the same type. The system uses the Banker's algorithm for deadlock avoidance. You are given that the system has 18 devices.

Job No.	Devices Allocated	Maximum Required
Job A	7	10
Job B	4	6
Job C	2	7
Job D	3	17

Answer the following questions:

8.1 Determine the remaining needs for each job [2]

8.2 Determine whether the system is in a safe or unsafe state. In case if you find out that it is unsafe, propose a scenario whereby the system can be changed to a safe state. 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 9

Assume that it takes 1 ms to travel from one track to the next, and that the arm is originally positioned at Track 53. The request queue (number of tracks) is 0-199. Note that the r/w arm should move towards the high-numbered tracks. (Ignore rotational time and transfer time, just consider seek time).

Compute how long it will take to satisfy the following track requests which are all present in the wait queue:

98, 183, 37, 122, 14, 124, 65, 67

9.1 Use the following seek strategy algorithm to draw/illustrate using a graph how the track requests will be serviced.

C-LOOK [6]

9.2 What is the total seek distance for 9.1? [2]

Question 10

In demand paging, a page replacement policy is used to manage system resources. Given that main memory has 4 page frames (N, U, S, T) available to programs and that a program consisting of 15 pages is to be loaded in main memory. The request pages are provided below in order:

1 0 2 1 4 3 1 0 2 0 4 3 1 2 4

Suppose that all the page frames are initially empty.

Using the following page removal algorithms and do a pages trace analysis indicating page faults.

10.1 Least Recently Used [7]

10.2 Most Recently Used (MRU) [7]

Question 11

Given the table below, answer the questions that follow.

Jobs	Required memory (KB)
Job 1	950
Job 2	330
Job 3	600
Job 4	940

Memory block	Size (KB)
1	650
2	400
3	1000
4	950

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

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

First-fit [4]

11.2 Calculate the total internal fragmentation for each algorithm stated in 11.1. [2]

End of Paper