



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: Bachelor of Computer Science in Cyber Security	
QUALIFICATION CODE: 07BCCS	LEVEL: 6
COURSE: Operating Systems	COURSE CODE: OPS621S
DATE: June 2019	SESSION: 1
DURATION: 3 hours	MARKS: 80

FIRST OPPORTUNITY 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 Interval between the time of submission and completion of the job is called:
- a) Waiting time
 - b) Turnaround time
 - c) Throughput
 - d) Response time.
- 1.2 In ----- several programs are kept in main memory at the same time.
- a) Multiprocessor
 - b) On- line operation
 - c) Buffering
 - d) Multiprogramming.
- 1.3 The Banker's Algorithm is an example of a(n) ----- policy.
- a) Mutual exclusion
 - b) Detection
 - c) Avoidance
 - d) Recovery
- 1.4 An algorithm designed to detect starvation by tracking how long each job has been waiting for resources is using the concept of -----.
- a) Deadlock
 - b) Aging
 - c) Preemption
 - d) Round robin

- 1.5 The strategy uses the same underlying philosophy as shortest job next, where the shortest jobs are processed first and longer jobs are made to wait.
- a) SSTF
 - b) FCFS
 - c) LOOK
 - d) SCAN
- 1.6 The scheduler is the part of an Operating System that determines the priority of each process.
- a) False
 - b) True
- 1.7 Access time is the sum of search time and transfer time
- a) True
 - b) False
- 1.8 The working set model is used to compute the average number of frames a job will need in order to run smoothly without causing thrashing.
- a) False
 - b) True
- 1.9 Shortest Remaining Time First is the best preemptive scheduling algorithm that can be implemented in an Operating System.
- a) False
 - b) True
- 1.10 Buffers are used to synchronize the movement of data between the relatively slow I/O devices and the very fast CPU.
- a) True
 - b) False

Section B [30 marks]

Question 2

Define the following terms as used in operation systems:

2.1 Search time [2]

2.2 Cache memory [2]

Question 3

Differentiate between fixed length records and variable length records. [4]

Question 4

Explain any four objectives of a process scheduling algorithm? [4]

Question 5

Explain any four properties of the indexed physical storage allocation method used by the file manager. [4]

Question 6

When designing the file structure for an operating system, name any three attributes that are considered. [3]

Question 7

7.1 Mention two advantages of using file extensions. [2]

7.2 Direct record organisation is one of the methods that can be used in physical file organisation. This shows how records are arranged and stored. State any three advantages of direct record organisation. [3]

Question 8

Name and explain the three strategies operating systems use to deal with deadlocks. [6]

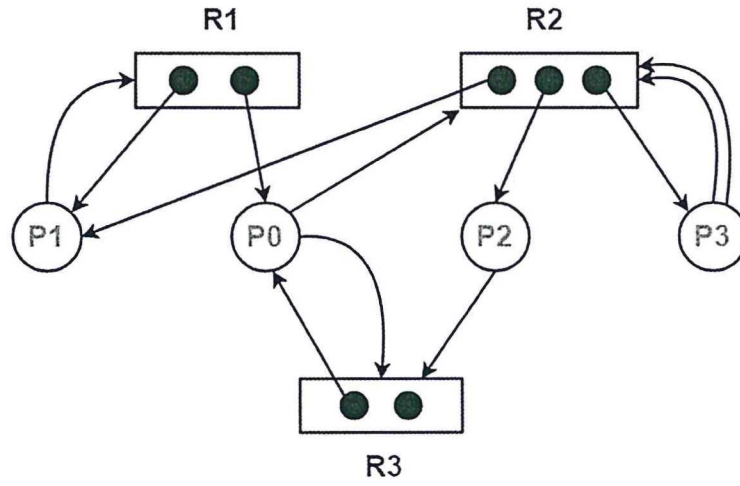
Section C [40 marks]

Question 9

For each of the following resource allocation graphs, find out and explain whether there is a deadlock or not.

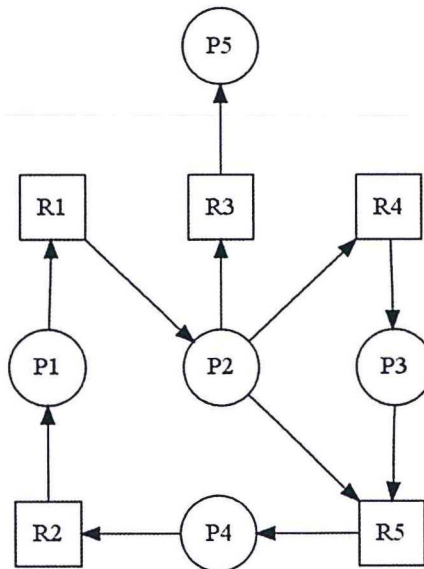
9.1

[2]



9.2

[2]



Question 10

Given the table below, answer the questions that follow.

Jobs	Required memory (KB)
Job 1	850
Job 2	370
Job 3	640
Job 4	930

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

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

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

First-fit [4]

10.2 Calculate the total internal fragmentation for each algorithm stated in 10.1. [2]

Question 11

In demand paging, a page replacement policy is used to manage system resources. Given that main memory has 3 page frames (O, P, S) 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:

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

Suppose that all the page frames are initially empty.

Using the Most Recently Used (MRU) page removal algorithms, do a pages trace analysis clearly indicating page faults.

Show how these pages will be allocated using the following page replacement policies. You are required to do a page trace analysis and clearly indicating when an interrupt or page fault has occurred.

11.1 First In First Out [5]

11.2 Least Recently Used [5]

Question 12

You would like to visualize the function of the process scheduler and you are given the following information about jobs that need to be processed:

Process	Arrival Time	Burst Time	Priority
P ₁	0	11	4
P ₂	4	7	6
P ₃	2	10	2
P ₄	4	6	4
P ₅	6	12	3

Draw a time line analysis (gantt chart) for each of the following scheduling algorithms:

- 12.1 Priority [6]
- 12.2 Shortest Job Next [6]
- 12.3 Calculate the average turnaround time for each algorithm. [2]
- 12.4 Calculate the average waiting time for each algorithm. [2]

Question 13

Suppose that a disk drive has 1000 cylinders, numbered 0 to 999. The drive is currently serving a request at cylinder 143, and previously it was at cylinder 125. The queue of pending requests, in FIFO order, is: 86, 600, 220, 940, 260, 770, 400, 850, 130.

Starting from the current head position, show/illustrate how these requests will look like using the LOOK seek strategy. [4]

End of Paper