NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: Bachelor of IT: Systems Administration and Networks; Bachelor of Computer Science in Cyber Security; Bachelor of Computer Science: Systems Administration; Communication Networks; Software Development	
QUALIFICATION CODE: 80BSAN / 07BACS / 07BCCS	**LEVEL:** 6
COURSE: Operating Systems	**COURSE CODE:** OPS621S
DATE: January 2019	**SESSION:** 2
DURATION: 3 hours	**MARKS:** 80

SECOND OPPORTUNITY / SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Mr. Nasimane Ekandjo & Ms. Jovita Mateus**
MODERATOR:	**Mr. Jeremiah Lumbasi**

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

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

1.1 CPU bound jobs (such as printing a series of documents) have many brief CPU cycles and long I/O cycles. (True/False)

1.2 With demand paging, three additional fields are introduced for each page in each PMT: one to determine if the page being requested is already in memory, a second to determine if the page contents have been modified while in memory, and a third to determine if the page has been referenced most recently. (True/False)

1.3 Paged memory allocation offers the advantage that it doesn't require the entire job to be stored in memory during its execution. (True/False)

1.4 Although noncontiguous allocation schemes eliminate external storage fragmentation and the need for compaction, they don't support direct access because there's no easy way to determine the exact location of a specific record. (True/False)

1.5 For a fixed partition system, memory deallocation is relatively complex. (True/False)

1.6 The transition from ____ is initiated by the Job Scheduler according to some predefined policy. At this point, the availability of enough main memory and any requested devices is checked.

a) READY to RUNNING
b) HOLD to READY
c) RUNNING to WAITING
d) RUNNING back to READY

1.7 In a paged memory allocation scheme, a page size that is too small will generate ____.

a) Excessive internal fragmentation
b) Excessive page faults
c) Very long Page Map Tables
d) Excessive external fragmentation

1.8 A disadvantage of segmented memory allocation is ____.

a) The physical size requirements of main memory
b) Internal fragmentation
c) The number of page faults
d) External fragmentation

1.9 Of the three components of access time in a movable-head DASD, ____ is the slowest.

a) Seek time
b) Search time
c) Transfer time
d) Delay time

1.10 file's ____ filename includes all path information for that file.

a) extended
b) relative
c) absolute
d) long-form

Section B [30 marks]

Question 2

2.1 Define the concept context switching as used in operation systems. [2]

2.1 Distinguish or differentiate between Cache memory and main memory. [4]

Question 3

3.1 Briefly explain the Process Control Block (PCB). [2]

3.2 State any two contents of a PCB. [2]

Question 4

4.1 Explain what blocking means in device management. [2]

4.2 List one advantage and one disadvantage of blocking. [2]

Question 5

Describe the two benefits and two drawbacks of large and small partition sizes. [4]

Question 6

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

Question 7

7.1 Explain two advantages of direct record organisation in file management. [2]

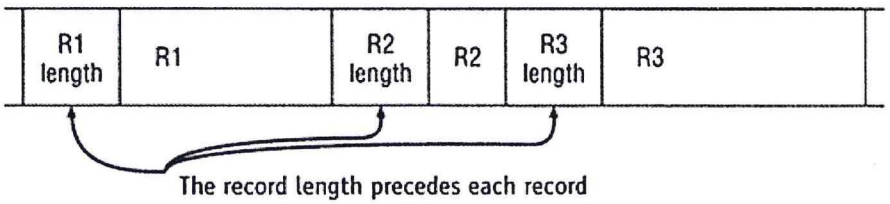
7.2 State any two factors that can affect the efficiency of the file manager. [2]

Question 8

Regarding physical file storage allocation, every record in a file must be stored in a specific record format. Match the following record format figures to their corresponding descriptions below:

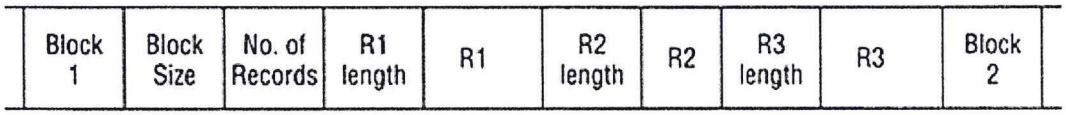
- Unblocked fixed-length records
- Blocked fixed-length records
- Unblocked variable-length records
- Blocked variable-length records

a)



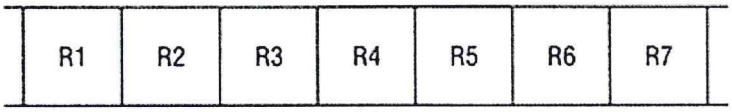
[1]

b)



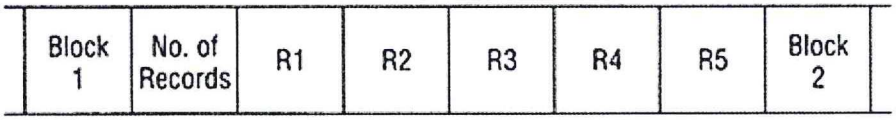
[1]

c)



[1]

d)



[1]

Section C [40 marks]

Question 9

Given that a program of size 5750 lines requires using main memory. Assume you are using the paged memory allocation scheme and the size of each page frame is 370 MB.
Answer the following questions given that 1 MB = 1 line of code:

9.1 How many pages will the job have? [1]

9.2 What would be the internal fragmentation? [2]

9.3 What will be the page number and displacement for the line 4000? (Pages are named from Page 0 ...) [2]

9.4 What will be the line number for a line in Page 7 with displacement 70? [2]

Question 10

Consider the following information about resources in a system:

Resource X has 2 units
Resource Y has 2 units
Resource Z has 3 units

Process 1 is holding none of the resources; and is requesting 2 units of X as well as 1 unit of Z.
Process 2 is holding 1 unit of X and 1 unit of Z; and is requesting 1 unit of Y.
Process 3 is holding 1 unit of Y and 1 unit of Z; and is requesting 1 unit of X.

10.1 Draw the resource allocation graph for the above described system. [5]

10.2 Is the system deadlocked? If so, state which processes are involved. If not, give an execution sequence that eventually ends, showing resource acquisition and release at each step. [2]

Question 11

Consider the following set of processes, their arrival times, their CPU cycle time and their priority:

Process	Arrival Time	CPU Cycle	Priority
P1	4	8	1
P2	6	4	12
P3	0	7	4
P4	11	4	7

Copy and fill in the table below with the process that is being executed by the CPU during that specific processing time. E.g. at processing time 7-8 Priority: P2; Round Robin: P4. Note that each row corresponds to a time unit.

Consider the information below:

- For time slice-based algorithms, assume time slice = 2.
- When a process arrives it is immediately eligible for scheduling. E.g. if Process 2 arrives at time 3, it can be scheduled during time unit 3-4.
- If a process is preempted, it is added at the tail of the ready queue.

  [10 (5 marks for each policy)]
- **Hint**: Pay close attention to arrival time for both scheduling algorithms!!

Processing Time	Priority	Round Robin
0-1		
1-2		
2-3		
3-4		
4-5		
5-6		
6-7		
7-8		
8-9		
9-10		
10-11		
11-12		
12-13		
13-14		
14-15		
15-16		
16-17		
17-18		
18-19		
19-20		
20-21		
21-22		
22-23		

11.2 A student suggests that Round Robin could be improved by reducing the quantum time to 1. What effect will this proposal have towards the system's performance? [2]

Question 12

Given that main memory is composed of page frames (Frame 1, Frame 2, Frame 3) for public use and that a program has been divided into six pages (A, B, C, D, E, F). Given that a program which is running requests pages in the following order:

E F B C B D E F A B C C D E F D B A C D D

Suppose the three page frames are initially empty.

Using the LRU page removal algorithm, do pages trace analysis indicating page faults with asterisks (*). Then compute the failure and success ratios. [7]

Question 13

You are given a 100 track disc (0-99). Also given that it takes 1 ms to travel from one track to the next, and that the head is originally positioned at Track 15 moving toward the hgiher-numbered tracks.

13.1 Compute how long it will take to satisfy the following requests using the strategy below:

50, 4, 40, 35, 11, 14, and 7

Note that all requests are present in the wait queue and arrived in the order from left to right. (Ignore rotational time and transfer time; just consider seek time).

C-LOOK [5]

13.2 What is the total seek distance for this strategy. [2]

End of paper