NAMIBIA 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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COURSE: Operating Systems	**COURSE CODE:** OPS621S
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FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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THIS QUESTION PAPER CONSISTS OF 5 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 The bounds register is used to store the highest (or lowest, depending on the specific system) location in memory accessible by each program. True/False

1.2 The primary advantage of storing programs in noncontiguous page frames (in a paged memory allocation scheme) is that main memory is used more efficiently because an empty page frame can be used by any page of any job. True/False

1.3 A field is a group of related records that can be identified by the user with a name, type, and size. True/False

1.4 Dual core or quad core multi-core chips are larger than a single-processor chip but produce less current leakage and heat. True/False

1.5 Deadlock is a system-wide tangle of resource requests that begins when two or more jobs are put on hold, each waiting for a vital resource to become available. True/False

1.6 Fill in the missing step in the following deadlock situation. Two users from the local board of education are each running a program (P1 and P2), and both programs will eventually need two DVD drives to copy files from one disc to another. Only two DVD-R drives are available and they are allocated on an "as requested" basis. Soon the following sequence transpires:

1) P1 requests drive 1 and gets it.
2) .....
3) P1 requests drive 2 but is blocked.
4) P2 requests drive 1 but is blocked.

a) P1 requests drive 2.
b) P2 requests drive 2 and gets it.
c) P2 requests drive 1 but is blocked
d) P1 releases drive 1

1.7 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) RUNNING to WAITING
c) RUNNING back to READY
d) HOLD to READY

1.8 By compacting and relocating, the Memory Manager optimizes the use of memory and thus improves throughput. However, it also requires more ____ than the other memory allocation schemes.

a) Null entries
b) Segmentation
c) Main memory
d) Overhead

1.9 _____ peripheral devices are assigned to only one job at a time.

a) Dedicated
b) Shared
c) Virtual
d) Static

1.10 In indexed storage, when a file is created, the pointers in the index block are all set to _____.

a) The end of the volume
b) The beginning of the volume
c) Null
d) zero

Section B [30 marks]

Question 2

Define the following terms as used in operation systems.

2.1 Spooling [2]

2.2 Swapping [2]

Question 3

In deadlock avoidance, a system can either be in a safe or unsafe state. Explain when a system is said to be in a safe state and when in an unsafe state. [4]

Question 4

4.1 What is demand paging? [2]

4.2 Describe how thrashing occurs in operating systems. [2]

4.3 Once thrashing is detected, explain what the operating system can do to stop it. [3]

Question 5

Explain three different access methods of a file. [6]

Question 6

6.1 Briefly describe how the Earliest Deadline First (EDF) scheduling algorithm works. [3]

6.2 State any two problems associated with EDF scheduling algorithm. [2]

Question 7

Four conditions need to be present for a deadlock to occur. Explain two conditions namely; mutual exclusion and circular wait. [4]

Section C [40 marks]

Question 8

Consider a system that has three processes (P1, P2, P3) and three reusable resources (R1, R2, R3).

There is one instance of R1, two instances of R2 and three instances of R3.

P1 holds an instance of R1 and an instance of R3 and is requesting R2.

P2 holds an instance of R3 and is requesting R1 and R2.

P3 holds two instances of R2 and an instance of R3 and is requesting R1.

8.1 Draw the resource allocation graph for this system. [7]

8.2 Is this system deadlocked or not? Explain your answer. [3]

Question 9

Consider the data in the table below to answer the questions that follow:

Job	Arrival Time	CPU Cycle
A	0	7
B	4	14
C	5	17
D	10	10
E	13	7

Calculate the start time and finish time for each of the five jobs using each of the following scheduling algorithms. You are not necessarily required to draw the time line analysis graphs (GANTT charts), but just to clearly state the start and finish times for each job. Ignore the time required for context switching and natural wait.

9.1 First Come First Serve (FCFS) [6]

9.2 Round Robin (RR) – Time slice = 4 [6]

9.3 For FCFS algorithm, calculate the total waiting time. [2]

9.4 For RR algorithm, calculate the total turnaround time. [2]

Question 10

You are given a disc having tracks numbered from 0-1700. Also given that it takes **2.5 ms** to travel from one track to the next, and that the head is originally positioned at Track 1000 moving towards the innermost tracks.

10.1 Compute how long it will take to satisfy the following requests / tracks using the strategies below: You are required to draw/illustrate how these algorithms/strategies will service the requests.

1400, 777, 70, 1577, 700, 1077, and 270

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).

a) SSTF [5]

b) SCAN [5]

10.2 What is the total seek time for each of the two algorithms mentioned in 10.1.

a) SSTF [2]

b) SACN [2]

End of Paper