(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR TWO SEMESTER TWO

FOR THE DEGREE OF
COMPUTER SCIENCE

COURSE CODE : CSC 224

COURSE TITLE : PRINCIPLES OF OPERATING SYSTEMS

DATE: 08/02/2021 TIME: 2:00 P.M – 4:00 P.M

INSTRUCTIONS:

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE [COMPULSORY] [30 MARKS]

a. List and briefly describe any 5 of the typical services provided by an OS. [5 marks]

b. For each of the following pairs of terms, define each term, making sure to clarify the key difference(s) between the two terms.

i. Process and processor [2 marks]

ii. Pre-emptive and non-preemptive [2 marks]

c. What are the primary differences between Network Operating System and Distributed Operating System? [4 marks]

d. What inconveniences that a user can face while interacting with a computer system, which is without an operating system? [4 marks]

e. Multi-programming (or multi-tasking) enables more than a single process to apparently execute simultaneously. Explain how this is this achieved on a uniprocessor? [4 marks]

f. What is the distinction between buffering, caching and spooling? [6 marks]

g. What is the function of the ready queue? [2 marks]

QUESTION TWO [20 MARKS]

Consider the following set of jobs to be scheduled for execution on a single CPU system.

JOB	Arrival Time	Size (msec)	Priority
J_1	0	10	2
J_2	2	8	1
J_3	3	3	3
J_4	10	4	2
J_5	12	1	3
J_6	15	4	1

Draw a Gantt chart showing FCFS scheduling for these jobs. [4 marks]

b. What is the relationship between threads and processes? [2 marks]

c. Detail three advantages and three disadvantages of user-level threads. [6 marks]

d. Context switching between two threads of execution within the operating system is usually performed by a small assembly language function. In general terms, what does this small function do internally? [4 marks]

QUESTION THREE [20 MARKS]

a. What is a race condition? Give two examples. [4 marks]

b. What is deadlock? What is starvation? How do they differ from each other? [4 marks]

c. i. What are the four conditions required for deadlock to occur? [4 marks]

ii. Describe four general strategies for dealing with deadlocks. [4 marks]

iii. Assuming the operating system detects the system is deadlocked, what can the operating system do to recover from deadlock? [4 marks]

QUESTION FOUR [20 MARKS]

a. i. Describe the difference between external and internal fragmentation. [4 marks]

ii. With reasons, indicate which of the two are most likely to be an issues on

a) A simple memory management machine using base limit registers and static partitioning, and [2 marks]

b) A similar machine using dynamic partitioning. [2 marks]

b. i. List and describe the four memory allocation algorithms covered in lectures. [8 marks]

ii. Which two of the four are more commonly used in practice? [2 marks]

QUESTION FIVE [20 MARKS]

a. i. Describe how buffering in the I/O subsystem of an operating system works. [4 marks]

ii. Give two reasons why it is required. [2 marks]
To handle differences in data transfer rates
To optimize performance

iii. Give a case where it is an advantage, and a case where it is a disadvantage. [2 marks]
ad: A case where buffering is an advantage is when dealing with slow I/O devices
dis: dealing with real-time applications, such as audio or video streaming.

process of temporarily storing data in a buffer before it is transferred to or from a device. This is done to manage the differences in data transfer rates between the CPU and the I/O devices, as well as to optimize the overall performance of the system.

with the aid of a well labeled diagram describe the five state process model. [5 marks]

ii. Describe round robin scheduling. [4 marks]

scheduler assigns a fixed time slice (also known as a quantum) to each process in a circular fashion. The scheduler switches between processes, giving each one a turn to execute for the duration of the time slice.

iii. What is the parameter associated with the scheduler? [1 mark]

time slice or quantam

iii. What is the issue in choosing the parameter? [2 marks]

The issue in choosing the time slice parameter is finding the right balance between responsiveness and efficiency. If the time slice is too short, the overhead of context switching between processes can become significant, reducing the overall system performance. If the time slice is too long, some processes may have to wait too long before they can execute, leading to poor responsiveness. The optimal time slice value depends on the specific workload and system characteristics.

New: The process is being created and is not yet ready to execute.
Ready: The process is ready to be executed by the CPU, but is waiting for the scheduler to allocate CPU time.
Running: The process is currently being executed by the CPU.
Waiting: The process is waiting for an event, such as I/O completion or a resource becoming available, before it can continue execution.
Terminated: The process has completed execution and is no longer active.