



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

SECOND YEAR SECOND SEMESTER

**FOR THE DEGREE
OF
BACHELOR IN COMPUTER SCIENCE**

COURSE CODE: BCS 224

COURSE TITLE: PRINCIPLES OF OPERATING SYSTEMS

DATE: Friday, 22nd April, 2022 **TIME:** 8:00-10:00

INSTRUCTIONS

Answer Question ONE and ANY other TWO Questions.

Question One (Compulsory)

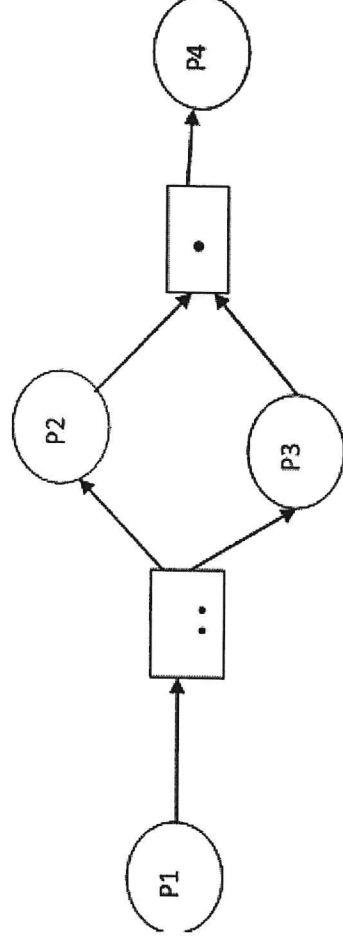
- a) Explain interrupts and traps, and provide a detailed account of the procedure that an operating system handles an interrupt [4 marks]
- b) How does the distinction between *kernel* mode and *user* mode function as a rudimentary form of protection (security) system? [4 marks]
- c) Define each of the following resource types and State **one** example of each type.
i) A preemptive resource. [2 marks]
ii) A non preemptive resource. [2 marks]
- d) Explain the following terms: *relocatable code*, *base register* and *logical address*. [3 marks]
- e) List **four** major activities of an operating system with regard to process management. [4 marks]
- f) An abstraction is a software function that hides lower level details and provides a set of higher-level functions. An operating system transforms the physical world of devices, instructions, memory, and time into virtual world that is the result of abstractions built by the operating system. Describe **three** reasons for this abstraction performed by the operating system. [6 marks]
- g) Describe the critical section problem, clearly showing the conditions under which such mechanisms operate. [5 marks]

Question Two

- a) Compare and contrast a process and a thread. [4 marks]
- b) What is a deadlock? Describe four necessary conditions for the occurrence of a deadlock. [6 marks]
- c) Describe the *Buddy* system of memory allocation. [2 marks]
- d) Show how the following process will be allocated in memory using a buddy system: Request A, 160K, Request B, 120K, Request C, 240, Release B, Request D 50, Request E 64 [8 marks]

Question Three

- a) State **Four** advantages of processes co-operating. [4 marks]
- b) Given a Resource Request Allocation Graph below



- i. Describe resource allocation processes illustrated in the diagram [4 marks]
 - ii. Show the a wait for graph(WFG) from the a above RAG [2 marks]
- c) Consider the following the table below, where four customers each of whom has been granted a number of credit units to:
- i. Calculate the need matrix [2 marks]
 - ii. Prove that the condition is safe or unsafe [8 marks]

Customers	Used	Max	
A	1	6	
B	1	5	
C	2	4	
D	4	7	
			Available Units = 2

Question Four

- a) Define concurrency as used in Interprocess Communication. [3 marks]
- b) List THREE discrete reasons why a process might leave the Ready state in an operating system using pre-emption, and which state it goes to in each case. [3 marks]
- c) On a system using non-preemptive scheduling, processes with expected run times of 6, 17, 10 and 13 are in the ready queue. In what order should they be run to minimize wait time? [6 marks]
- d) For the processes listed in the table below:

Process	Arrival time	Processing time
A	0	4
B	2	7
C	3	2
D	3	2

- i) Draw a chart illustrating their execution using determine their execution using Round Robin (quantum =2). [4 marks]
- ii) Determine turnaround time. [4 marks]

Question Five

a) Distinguish between the following file management system concepts:

- i. *Full pathname* and *relative pathname*
- ii. *Spanned* and *unspanned blocking*
- iii. *Direct access* and *index access*

[6 marks]

b) Describe **two** problems that could occur if a system allowed a file system to be mounted simultaneously at more than one location.

[4 marks]

c) Consider a system that supports the strategies of *contiguous*, *linked*, and *indexed* allocation. Explain the **major** criteria that should be used in deciding which strategy is best utilized for a particular file.

[6 marks]

d) Compare *programmed I/O* with *Direct Memory Access (DMA) I/O* and show why DMA is a better technique for data transfer.

[4 marks]