School of Information Technology and Engineering (SITE)

Assessment Details and Submission Guidelines	
Unit Code	BN104
Unit Title	Trimester 2, 2024 – Operating System
Course Name	Bachelor of Networking (BNet) Bachelor of Networking Major in Cyber Security (BNet(CybSec))
Assessment Type	Individual Assignment 2
Assessment Title	Assignment 2
Purpose of the assessment (with ULO Mapping)	This assignment is designed to assess student's knowledge and skills related to the following learning outcomes: a. Report on the basics, and provide examples, of operating systems structure and functionality, including memory allocation, virtual memory, demand paging and process and device management. b. Describe the integration of hardware, operating systems and application software. c. Explain in detail the functioning of some devices such as peripherals (e.g. printers and network connections). d. Discuss the most common file systems structure and technology. e. Explain the concept of user interfaces and their role in the functionality of an OS. f. Demonstrate competency in the use of a command line interface to operate with and manage an OS such as UNIX, and perform simple UNIX (Linux) administration. g. Support and troubleshoot operating systems and applications at an introductory level.
Weight	20%
Total Marks	100 Marks
Word Limit	1500-2000
Due Date	**Report submission: Week 11 (Sunday 29/09/2024, 11:59 PM)**
Submission Guidelines	**USE OF GENERATIVE AI TOOLS IS NOT PERMITTED IN THIS ASSIGNMENT** • All work must be submitted on Moodle by the due date along with a completed Assignment Cover Page. • The assignment must be in MS Word format, 1.5 spacing, 11-pt Calibri (Body) font and 2 cm margins on all four sides of your page with appropriate section headings. • Reference sources must be cited in the text of the report and listed appropriately at the end in a reference list using IEEE referencing style.

Extension	If an extension of time to submit work is required, a Special Consideration Application must be submitted directly on AMS. You must submit this application three working days prior to the due date of the assignment. Further information is available at: https://www.mit.edu.au/about-us/governance/institute-rules-policies-and-plans/policies-procedures-and-guidelines/assessment-policy
Academic Misconduct	Academic Misconduct is a serious offence. Depending on the seriousness of the case, penalties can vary from a written warning or zero marks to exclusion from the course or rescinding the degree. Students should make themselves familiar with the full policy and procedure available at: https://www.mit.edu.au/about-mit/institute-publications/policies-procedures-and-guidelines/AcademicIntegrityPolicyAndProcedure. For further information, please refer to the Academic Integrity Section in your Unit Description.
Use of Generative Artificial Intelligence (GenAI) in Assessments	More information about the use of Gen AI in student assessment can be found in the full policy and procedure available at: https://www.mit.edu.au/about-mit/institute-publications/policies-procedures-and-guidelines/GenAIinLearningTeachingAndResearch Further support can be found in the MIT LibGuide: Using Gen AI at MIT. Further details on the type of assessment tasks, and whether Gen AI is permitted to be used or not are provided in the assessment brief.

A. Operating Systems Basics   **(15 Marks)**

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1. Troubleshooting of Operating Systems

As covered in our various lectures, operating systems are inherently prone to technical issues due to their complex nature, and achieving absolute faultlessness is not feasible. These technical faults can disrupt user experience and must be addressed promptly to restore the operating system's functionality for running applications. Consequently, it is essential for network professionals to be well-versed in the troubleshooting tools and techniques for operating systems.

In this assignment, you are required to explore common operating system problems and the methods to resolve them. **Your report should include detailed descriptions of at least five (5) distinct faults and the corresponding solutions or tools with relevant screenshots to address these issues**

(2X5=10 Marks)

2.   Operating System Types and Applications

What distinguishes a real-time operating system from other types of operating systems? Provide three examples of applications where a real-time operating system is essential, and explain the reasons.   (1+3+1=5 Marks)

B. Memory Management   (5 Marks)

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3.   Memory Relocation

Analyse the main memory allocation status shown in Figure 1. Perform memory compaction using two different approaches, and report which scheme required less data movement. What are the advantages of memory relocation in a practical setting?   (5 Marks)
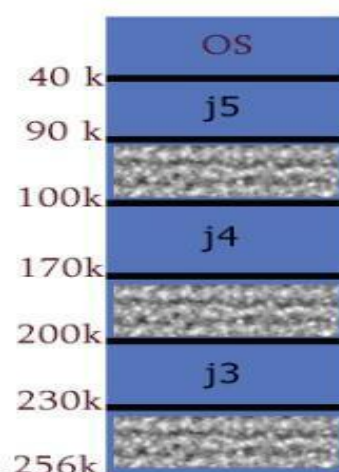

Figure 1: memory diagram of computer system

C. Process, deadlock, Device and File Management   **(60 Marks)**

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4. **Process**

Given the following jobs/processes, burst time, and arrival times in table 1, compute the completion time, turnaround time, and waiting time for each job in a table. Draw the Gantt chart and suggest an application for each job. (Consider 5 as a highest priority and 0 as a lowest priority).

   a) Shortest Job First Scheduling (SJF) algorithm.

   b) Shortest Remaining time (SRT) algorithm.

   c) Round-Robin Scheduling algorithm (consider time slice is 4ms).

Process	Burst Time	Arrival Time	Priority
P1	11	2	3
P2	28	1	1
P3	2	3	4
P4	10	4	2
P5	16	5	5

Table 1

(3x5=15 Marks)

5. **Deadlock**

What is the impact of deadlock on system performance, and how can it affect the execution of processes? Discuss potential solutions to mitigate these effects. Observe the following "Resource Allocation graph" and discuss if there is any deadlock found.   **(2+2+3+3=10 Marks)**
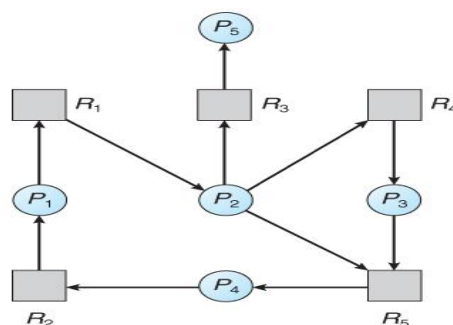

Figure 2: Resource allocation graph

6. **Device Management and Seek Strategies**

On a hard disk, the queue of track requests is as shown below in Figure 3:

52	48	20	15	99	140	130	48	195

Figure 3: Queue of track requests

Assume that the head starts at track 50, draw the diagrams for the arm movement of the following seek strategies. Also, calculate the total and average numbers of tracks travelled for each seek strategy. Based on this calculation, report which one is the best strategy in this case with your own justification. (6x5=30 Marks)

     a) FCFS

     b) SSTF

     c) SCAN

     d) C-SCAN

     e) LOOK

     f) C-LOOK

7. **File Systems**

Examine and analyse two of the most prevalent file systems employed in contemporary operating systems. Provide a detailed exploration of their architectures, functionalities, and distinguishing features, and discuss their respective advantages and limitations in the context of modern computing environments. (5 Marks)

D. Unix Operating Systems and User Interface   **(15 Marks)**

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8. **User Interfaces**

Evaluate the effectiveness of voice user interfaces (VUIs) in enhancing accessibility and user convenience. How do VUIs handle natural language processing and context awareness, and what challenges do they face in terms of user comprehension and system reliability? (5 Marks)

9. **Unix Commands**

     You must provide screenshot to demonstrate reach of the following.
1. How can you change the permissions of a file to be readable and writable only by the owner and executable by everyone else, and verify the changes?

2. How can you list all files and directories, including hidden ones, in the current directory with detailed information such as permissions, owner, and size?

3. How can you copy a file named **assignment2.txt** from the current directory to a directory named **bn104**?

4. How can you view the contents of a file named **report.txt** page by page?

5. How can you search for a specific string" **issue**" in a file named **file1.txt**?

(2X5=10 Marks)

10. References

<mark>Provide at least 10 references in IEEE style with in-text citation. You must provide current references (no more than 5 years older) from reliable resources such as text books, journals, conference papers etc**.**</mark>

Marking criteria:

Example of marking criteria is shown in following table. Marks are allocated as follows:

Section	Question Number	Description of the section	Marks
Operating systems basic	1	Troubleshooting of operating systems	10
	2	Operating system types and applications	5 Total = 15
Memory management	3	Memory relocation	5 Total =5
Process, deadlock, device and file management	4	CPU scheduling algorithms	15
	5	Deadlock	10
	6	Seek strategies problem and analysis	30
	7	File system investigation	5 Total = 60
Systems and User interface	8	User interface	5
	9	Unix commands	10 Total = 15
Reference style and report formatting		Submit properly formatted referenced report. Follow IEEE reference style and in-text citations. Provide at least 10 references.	5
		<mark>Total</mark>	<mark>100</mark>