Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

Department of Computer Technology

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: Dream of where you want.	**Mission:** Means to achieve Vision

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
(Signature and Date in Handwritten)

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Session	**2025-26 (ODD)**	**Course Name**	**Operating System Lab**
Semester	**5**	**Course Code**	**23IOT1504**
Roll No	**12**	**Name of Student**	**Maitreyi Gaidhane**

Practical Number	**09**
Course Outcome	1. Understand Computer System Configuration and Simulate system resources efficiently using Linux Commands (CO1) 2. Analyse operating system functionalities utilizing system calls, thread programming and process scheduling algorithms (CO2) 3. Apply Synchronization primitives to implement a Deadlock-free solution(CO3) 4. Simulate Disk scheduling, Memory allocation, File allocation, page replacement algorithms (CO4)
Aim	Simulate All File Allocation Stratergies- A. Sequential B. Indexed C. Linked
Problem Definition	
Theory (100 words)	File allocation refers to the method by which operating systems allocate disk space to files. Different strategies offer trade-offs between efficiency, fragmentation, and access speed. **Three Main Allocation Strategies:** 1. **Sequential Allocation** o Files are stored in contiguous disk blocks o Requires pre-allocation of space o Fast sequential access but suffers from external fragmentation 2. **Indexed Allocation** o Uses an index block containing pointers to all file blocks o Supports both sequential and direct access o Eliminates external fragmentation but has index block overhead 3. **Linked Allocation** o Each block contains a pointer to the next block o No external fragmentation o Sequential access only, with pointer storage overhead

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Procedure and Execution (100 Words)	Step for Implementation: **Sequential Allocation Implementation** Algorithm: 1. Search for contiguous free blocks of required size 2. If found, allocate all blocks to the file 3. Mark blocks with file ID **Indexed Allocation Implementation** Algorithm: 1. Find free block for index table 2. Find scattered free blocks for file data 3. Store file ID in index block and data blocks **Linked Allocation Implementation** Algorithm: 1. Find any free blocks (need not be contiguous) 2. Allocate blocks and mark with file ID 3. Maintain logical linking through data structure

	Code:
	#include <stdio.h>
	#include <stdlib.h>
	#include <string.h>
	
	#define DISK_SIZE 50
	#define MAX_FILES 5
	
	int disk[DISK_SIZE];
	int file_count = 0;
	
	void init_disk() {
	for(int i = 0; i < DISK_SIZE; i++) {
	disk[i] = -1;
	}
	}
	
	void show_disk() {
	printf("\nDisk: ");
	for(int i = 0; i < DISK_SIZE; i++) {
	if(disk[i] == -1) printf(". ");
	else printf("%d ", disk[i]);
	}

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```
    printf("\n");
}

void sequential() {
    char name[20];
    int size, start = -1, count = 0;

    printf("File name: ");
    scanf("%s", name);
    printf("Size (blocks): ");
    scanf("%d", &size);

    for(int i = 0; i < DISK_SIZE; i++) {
        if(disk[i] == -1) {
            if(count == 0) start = i;
            count++;
            if(count == size) break;
        } else {
            count = 0;
        }
    }

    if(count < size) {
        printf("Not enough contiguous space!\n");
        return;
    }

    for(int i = start; i < start + size; i++) {
        disk[i] = file_count;
    }

    printf("File '%s' allocated at block %d (ID: %d)\n", name, start, file_count);
    file_count++;
}

void indexed() {
    char name[20];
    int size, index_block = -1;
    int blocks[10], block_count = 0;

    printf("File name: ");
    scanf("%s", name);
    printf("Size (blocks): ");
```

```
    scanf("%d", &size);

    for(int i = 0; i < DISK_SIZE; i++) {
        if(disk[i] == -1) {
            index_block = i;
            break;
        }
    }

    if(index_block == -1) {
        printf("No space for index block!\n");
        return;
    }

    for(int i = 0; i < DISK_SIZE && block_count < size; i++) {
        if(disk[i] == -1 && i != index_block) {
            blocks[block_count++] = i;
        }
    }

    if(block_count < size) {
        printf("Not enough data blocks!\n");
        return;
    }

    disk[index_block] = file_count;
    for(int i = 0; i < size; i++) {
        disk[blocks[i]] = file_count;
    }

    printf("File '%s' allocated (ID: %d), Index block: %d\n", name, file_count,
index_block);
    file_count++;
}

void linked() {
    char name[20];
    int size;
    int blocks[10], block_count = 0;

    printf("File name: ");
    scanf("%s", name);
    printf("Size (blocks): ");
```

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```
    scanf("%d", &size);

    for(int i = 0; i < DISK_SIZE && block_count < size; i++) {
        if(disk[i] == -1) {
            blocks[block_count++] = i;
        }
    }

    if(block_count < size) {
        printf("Not enough space!\n");
        return;
    }

    for(int i = 0; i < size; i++) {
        disk[blocks[i]] = file_count;
    }

    printf("File '%s' allocated (ID: %d), Blocks: ", name, file_count);
    for(int i = 0; i < size; i++) {
        printf("%d", blocks[i]);
        if(i < size-1) printf("->");
    }
    printf("\n");
    file_count++;
}

void delete_file() {
    int id;
    printf("File ID to delete: ");
    scanf("%d", &id);

    int found = 0;
    for(int i = 0; i < DISK_SIZE; i++) {
        if(disk[i] == id) {
            disk[i] = -1;
            found = 1;
        }
    }

    if(found) printf("File %d deleted!\n", id);
    else printf("File not found!\n");
}
```

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```
int main() {
   int choice;
   init_disk();

   printf("=== Simple File Allocation Simulator ===\n");

   while(1) {
      printf("\n1. Sequential\n2. Indexed\n3. Linked\n4. Show Disk\n5. Delete
File\n6. Exit\nChoice: ");
      scanf("%d", &choice);

      switch(choice) {
         case 1: sequential(); break;
         case 2: indexed(); break;
         case 3: linked(); break;
         case 4: show_disk(); break;
         case 5: delete_file(); break;
         case 6: exit(0);
         default: printf("Invalid choice!\n");
      }
   }

   return 0;
}
```

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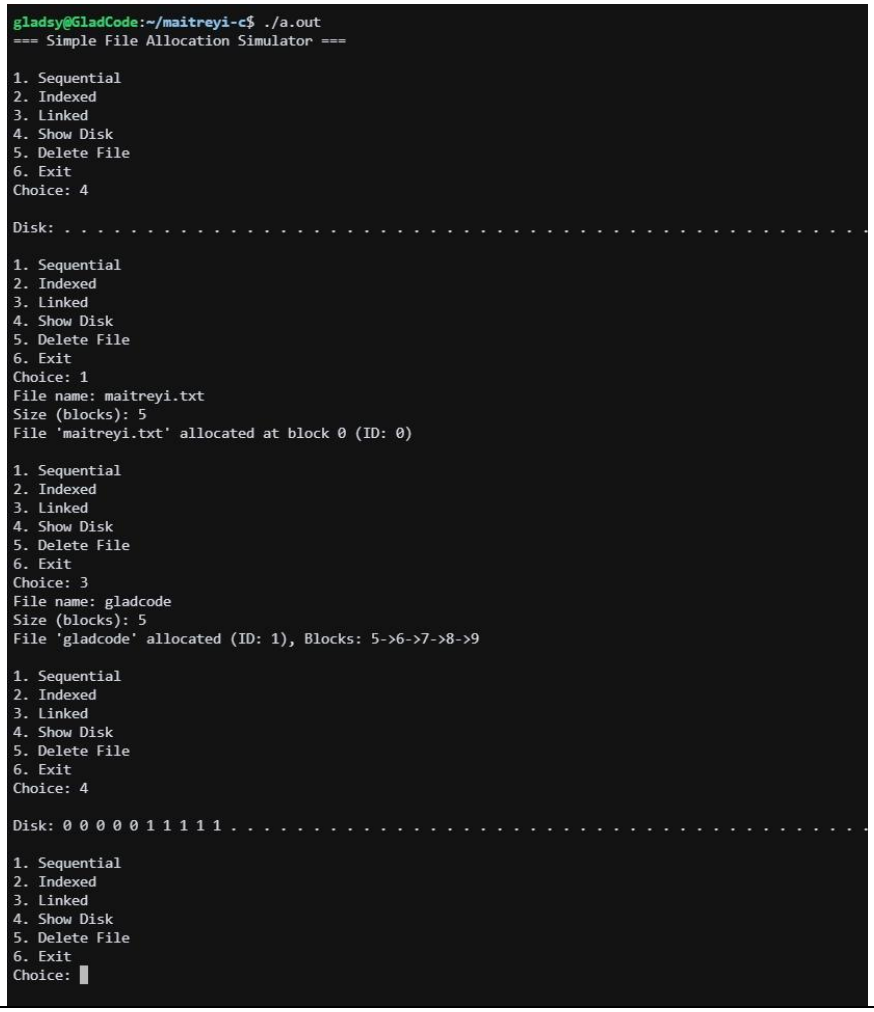
	Output: 
Output Analysis	**Scenario 1: Sequential Allocation** • Contiguous blocks 0-4 allocated • Shows clean contiguous allocation pattern **Scenario 2: Indexed Allocation** • Block 5 serves as index block • Data blocks scattered but linked through index**Scenario 3: Linked Allocation** • Blocks linked in sequence 6→7→8→9 • Visual representation shows scattered allocation **Fragmentation Analysis:** **Sequential:** • External fragmentation evident as files are deleted

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<table>
<tr><td></td><td>

Large contiguous spaces become fragmented

Indexed/Linked:

No external fragmentation
Efficient space utilization

Performance Characteristics:
<table>
<tr><td>Strategy</td><td>Access Time</td><td>Fragmentation</td><td>Space Overhead</td></tr>
<tr><td>Sequential</td><td>Fast sequential</td><td>High external</td><td>None</td></tr>
<tr><td>Indexed</td><td>Direct access</td><td>None</td><td>Index block</td></tr>
<tr><td>Linked</td><td>Sequential only</td><td>None</td><td>Pointers</td></tr>
</table>
</td></tr>
<tr><td>Link of student Github profile where lab assignment has been uploaded</td><td></td></tr>
<tr><td>Conclusion</td><td>This program effectively demonstrates:

How different allocation strategies manage disk space
The impact of allocation methods on disk fragmentation
The relationship between allocation strategy and file access patterns
Practical implementation of operating system concepts

This program serves as an excellent educational tool for understanding fundamental file system concepts and the practical implications of different allocation strategies in operating systems.</td></tr>
</table>

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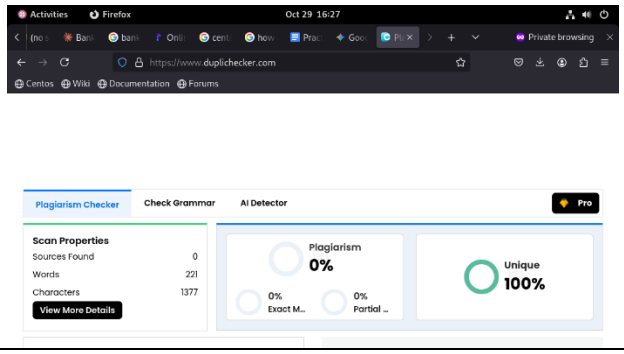
Plag Report (Similarity index < 12%)	
Date	**29/10/25**