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Internal Assessment Test 2 – Jan 2026

Sub:	Operating Systems					Sub Code:	BCS303	Branch:	AIML/CSE-AIML
Date:	___/__/26	Duration:	90 min	Max Mark	50	Sem & Sec:	III A, B, C		OBE

	Answer any FIVE FULL Questions	MARKS	CO	P3
1	Consider the following page reference stream: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,0,1 How many page faults would occur for LRU and FIFO replacement algorithms assuming 3-page frames? Which one of the two is more efficient?	10	5	3
2(a)	What is a file? What are its attributes?	5	3	1
2 (b)	Explain file operations in detail.	5	3	1
3	Given the memory partitions of 100k, 500k, 200k,300k and 600k apply first fit, best fit and worst fit algorithms to place 212k, 417k, 112k and 426k.	10	4	3

1. Answers-

FIFO Page Replacement

We replace the **oldest loaded page**.

Step-by-step evaluation gives:

Total FIFO page faults = 15

LRU Page Replacement

We replace the **least recently used page**.

Step-by-step evaluation gives:

Total LRU page faults = 12

FIFO → **15 page faults**

LRU → **12 page faults**

LRU is more efficient

2. (a)-answer-

A **file** is a **collection of related information** stored on secondary storage (such as a hard disk or SSD) and identified by a **unique name**. It is the **basic unit of storage** used by the operating system to store and retrieve data permanently.

File Attributes

File attributes provide **information about a file** and are maintained by the operating system.

1. **Name**

    - Human-readable name of the file (e.g., `data.txt`).
2. **Identifier**
    - A unique number (often inode number) used internally by the OS to identify the file.
3. **Type**
    - Indicates the type of file (text file, binary file, executable, etc.).
4. **Location**
    - Pointer to the physical location of the file on storage.
5. **Size**
    - Current size of the file in bytes, words, or blocks.
6. **Protection (Permissions)**
    - Access control information such as read, write, and execute permissions.
7. **Time, Date, and User Identification**
    - Includes:
        - Creation time
        - Last modification time
        - Last access time

2.(b). Answer-

File operations are actions performed by the operating system to manage files.

1. **Create** – Creates a new file and allocates space.
2. **Open** – Opens a file in read/write/append mode.
3. **Read** – Reads data from the file.
4. **Write** – Writes data into the file.
5. **Append** – Adds data at the end of the file.
6. **Seek** – Moves the file pointer to a specific location.
7. **Close** – Closes the file and frees resources.
8. **Delete** – Removes the file from storage.
9. **Truncate** – Clears file contents without deleting the file.
10. **Get/Set Attributes** – Accesses or modifies file properties.

3. Answer-

Given

Memory partitions: 100k, 500k, 200k, 300k, 600k
Processes: 212k, 417k, 112k, 426k

1.First Fit

(First partition that is large enough)

- 212k → **500k**
- 417k → **600k**
- 112k → **200k**
- 426k → **Not allocated**

2.Best Fit

(Smallest partition that is large enough)

- 212k → **300k**
- 417k → **500k**

- 112k → **200k**
- 426k → **600k**

3.Worst Fit

(Largest available partition)

- 212k → **600k**
- 417k → **500k**
- 112k → **300k**
- 426k → **Not allocated**

4	Discuss the structure of the page table with a suitable diagram	10	4	
5	What is segmentation? Explain the basic method of segmentation with an example.	10	4	2
6	**Consider the following snapshot of the system:**	10	5	3

PID	Allocation				Max				Available			
P0	2	0	0	1	4	2	1	2	3	3	2	1
P1	3	1	2	1	5	2	5	2				
P2	2	1	0	3	2	3	1	6				
P3	1	3	1	2	1	4	2	4				
P4	1	4	3	2	3	6	6	5				

Answer the following using Banker's Algorithm.

i) Is the system in a safe state? If so, write the safe sequence.

If the process P2 requests (0,1,1,3) resources can it be granted immediately?

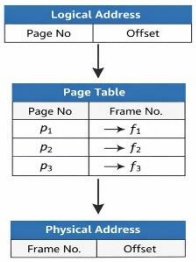
4. answer-

A **page table** is used by the operating system to map **logical addresses** to **physical addresses**. Each process has its own page table.

Each **page table entry (PTE)** contains:

- **Frame number** – location of the page in physical memory
- **Valid/Invalid bit** – page present or not
- **Protection bits** – access rights
- **Dirty bit** – page modified or not

Diagram:



5. answer-
Segmentation is a memory management technique in which a program is divided into **logical segments** such as **code, data, stack, and heap**, based on the programmer's view.

Basic Method of Segmentation

- Each segment has a **segment number** and an **offset**.
- A **segment table** stores:
  - **Base address** of each segment
  - **Limit** (length) of each segment
- Logical address = ⟨segment number, offset⟩
- If offset < limit → physical address = base + offset

Example

A program has:

- Segment 0: Code
- Segment 1: Data
- Segment 2: Stack

Logical address ⟨1, 100⟩ means **100th byte of Data segment**.
Physical address = base of segment 1 + 100.

6. answer-

i) Safe State Check

After calculating **Need = Max − Allocation**, a **safe sequence exists**.

System is in a safe state
Safe sequence:
⟨ P1 → P3 → P4 → P0 → P2 ⟩

ii) P2 Request = (0, 1, 1, 3)

The request **exceeds the available resources**, hence:

The request cannot be granted immediately

Faculty Signature CCI Signature HOD Signature