SHORT Notes PDF unit 1,2,3,4,5

📘 UNIT–1: OPERATING SYSTEM CONCEPTS – NOTES

⭐ 1.1 Operating System – Concept & Components

Operating System (OS)

OS ek system software hota hai jo user aur hardware ke beech interface ka kaam karta hai.

Example: Windows, Linux, Android, iOS.

Functions of OS

Program management

Memory management

File management

Device management

Security & protection

Process & CPU management

Components of OS

1. Kernel – Main part, hardware ko control karta hai.

2. Shell – Commands ko interpret karta hai.

3. File System – Data ko organize karta hai.

4. Device Drivers – Hardware ko control karne wale software.

⭐ 1.2 Functions of OS

1. Program Management

Programs ko load/run karta hai, unka execution manage karta hai.

2. Resource Management

CPU time, memory, devices sabko allocate karta hai.

3. File Management

Files create/delete/update karta hai.

4. Device Management

Printers, keyboards, disks ko manage karta hai.

5. Security & Protection

Passwords, permissions, access control.

⭐ 1.3 Views of OS

User View

OS hardware ko easy banata hai (user friendly).

System View

OS ek resource manager ka kaam karta hai.

⭐ 1.4 Types of Operating System

1. Batch OS – Jobs batch me run hote hain.

2. Multiprogramming OS – Multiple programs memory me.

3. Time-sharing OS – Har user ko small time slice milta hai.

4. Multiprocessing OS – Multiple CPU.

5. Real-time OS – Time critical tasks.

6. Distributed OS – Multiple computers par tasks.

7. Mobile OS – Android/iOS.

⭐ 1.5 Services of Operating System

Program execution

Input/Output operations

File system manipulation

Communication

Error detection

Protection

⭐ 1.6 System Calls

System calls special functions hote hain jinke through user program OS se service mangta hai.

Types of System Calls

Process control

File management

Device management

Information maintenance

Communication

📘 UNIT–2: PROCESS MANAGEMENT – NOTES

⭐ 2.1 Process, States & PCB

Process

Running program = Process.

Process States

New

Ready

Running

Waiting

Terminated

PCB (Process Control Block)

Contains:

PID

Process state

Registers

Program counter

Memory info

I/O status

⭐ 2.2 Process Scheduling

OS process ko CPU assign karta hai.

Scheduling Queues

Ready queue

Job queue

Device queue

Schedulers

1. Long-term scheduler – Which process enters memory

2. Short-term scheduler – CPU ko kaun milega

3. Medium-term scheduler – Swapping control

⭐ 2.3 Inter-Process Communication (IPC)

Processes ek dusre se communicate karte hain.

Methods:

1. Shared Memory

Fast

Common memory region

2. Message Passing

Slow but secure

Send/receive messages

⭐ 2.4 Threads

Thread – Light-weight Process

Ek program ke multiple parts parallel run hote hain.

Types

User-level threads

Kernel-level threads

Multithreading Models

Many-to-One

One-to-One

Many-to-Many

📘 UNIT–3: CPU SCHEDULING & ALGORITHMS – NOTES

⭐ 3.1 Scheduling Concepts

CPU Scheduling

CPU kis process ko milega — OS decide karta hai.

Preemptive vs Non-preemptive

Preemptive: Process ko interrupt kiya ja sakta hai

Non-preemptive: Interrupt nahi hota

Scheduling Criteria

CPU utilization

Throughput

Turnaround time

Waiting time

Response time

⭐ 3.2 Scheduling Algorithms

1. FCFS (First Come First Serve)

Non-preemptive

Process jo pehle aata hai, pehle CPU leta hai.

2. SJF (Shortest Job First)

Smallest burst time wala process pehle.

3. SRTF (Shortest Remaining Time First)

SJF ka preemptive version.

4. Round Robin (RR)

Time slice (quantum) diya jata hai.

Fair scheduling.

5. Priority Scheduling

Process priority ke basis par run hote hain.

6. Multilevel Queue Scheduling

Different queues for different users.

⭐ 3.3 Deadlock

Deadlock

Jab do ya zyada processes ek dusre ke resource ka wait karein.

Necessary Conditions

1. Mutual Exclusion

2. Hold and Wait

3. No Preemption

4. Circular Wait

Handling Deadlock

Deadlock prevention

Deadlock avoidance

Deadlock detection

Recovery

📘 UNIT–4: MEMORY MANAGEMENT – FULL NOTES

⭐ 4.1 Basic Memory Management

Memory management ka kaam hai programs ko memory allot karna aur efficiently use karna.

1. Partitioning

Memory ko parts (partitions) me divide kiya jata hai.

(a) Fixed Partitioning

Memory fixed size blocks me hoti hai.

Internal fragmentation hota hai.

Simple method.

(b) Variable Partitioning

Partition size program ke size ke hisaab se hota hai.

External fragmentation ho sakta hai.

⭐ Fragmentation

Internal Fragmentation

Block ke andar unused space.

External Fragmentation

Free memory small pieces me scattered ho jati hai.

⭐ Compaction

External fragmentation ko reduce karne ke liye free memory ek jagah lana.

⭐ Free Space Management

Memory me free blocks ko track karne ke methods:

1. Bitmap

Memory ko small units me divide kar ke 0/1 use kiya jata hai.

2. Linked List

Free blocks linked list ki form me maintain kiye jate hain.

⭐ 4.2 Virtual Memory

Virtual memory ek large memory ka illusion deti hai.

Paging

Memory fixed-size pages me divided hoti hai (logical + physical).

Page Table logical pages ko physical frames se map karta hai.

⭐ Segmentation

Memory variable-sized segments me hogi.

Logical division jaisa: Code, Data, Stack.

⭐ Page Fault

Jab required page RAM me na ho — OS page ko disk se load karega.

⭐ Thrashing

Excessive page faults → CPU time memory swapping me waste hota hai.

⭐ 4.3 Page Replacement Algorithms

1. FIFO (First In First Out)

Jo page sabse pehle aaya tha, wo pehle niklega.

2. LRU (Least Recently Used)

Jo page sabse pehle use hua, wo replace hoga.

3. Optimal

Future references ke basis par best page choose kiya jata hai (least future use).

Belady’s Anomaly

FIFO me sometimes frames badhne par page faults increase ho jate hain.

📘 UNIT–5: FILE MANAGEMENT – FULL NOTES

⭐ 5.1 File Concepts

File

Related information ka collection.

File Attributes

Name

Type

Location

Size

Protection

Time, date, user information

File Operations

Create

Open

Read

Write

Delete

Close

File System Structure

Logical + physical view of storing data.

⭐ 5.2 File Access Methods

1. Sequential Access

Data sequence me read/write hota hai.

2. Direct Access

Record number ke through direct access possible.

3. Indexed Access

Index table banaya jata hai jisme pointers stored hote hain.

⭐ 5.2 File Allocation Methods

Memory me files ko kaise store karna hai:

1. Contiguous Allocation

File continuous blocks me stored hoti hai.

Fast but causes external fragmentation.

2. Linked Allocation

Each block contains pointer to next block.

No external fragmentation.

Slow random access.

3. Indexed Allocation

All block addresses stored in an index block.

Best method.

⭐ 5.3 Directory Structure

Directory = File system ka index.

1. Single-level Directory

Sab files ek hi directory me.

Name conflict problem.

2. Two-level Directory

Har user ki separate directory.

3. Tree-Structured Directory

Root + subdirectories (MOST USED).

4. Acyclic Graph Directory

Files aur directories share ho sakti hain.

⭐ Disk Organization

Physical Structure

Sectors, tracks, cylinders.

Logical Structure

Files, directories, partitions.