**Problem 1: Project Management**

**Problem Statement**:

Decompose the development of a project management tool that includes task tracking, team collaboration, and reporting features. Decide which approach (top-down or bottom-up) is more suitable and explain why.

**Instructions**:

1. Identify the main goal of the tool.
2. Select the top-down or bottom-up approach based on the problem requirements.
3. Identify and break down the system into features and tasks.
4. Explain why the chosen approach is appropriate.

**Main Goal:**

To develop a **project management tool** that enables **task tracking**, **team collaboration**, and **reporting**, helping teams manage projects efficiently from planning to completion.

**Chosen Approach: Top-Down**

**Reason for Choosing Top-Down:**

* The overall structure and purpose of the tool is clear.
* The system requires high-level planning with well-defined interactions between major components (tasks, users, reports).
* Dependencies between components are logical and hierarchical (e.g., reporting depends on task tracking data).
* A top-down approach helps define the system architecture first and ensures alignment with project goals.

**Top-Down Breakdown:**

**Step 1: Identify Major Functions**

1. Task Tracking
2. Team Collaboration
3. Reporting and Analytics
4. User Management
5. Project Settings and Administration

**Step 2: Break Down Major Functions into Specific Tasks**

1. Task Tracking

* Create Tasks: Title, description, due date, priority
* Edit/Delete Tasks
* Assign Tasks to Team Members
* Track Status: To-Do, In Progress, Done
* Add Subtasks and Checklists

2. Team Collaboration

* Commenting System on Tasks
* Real-time Notifications
* File Sharing
* Mentions and Tagging
* Activity Feeds

3. Reporting and Analytics

* Project Progress Dashboard
* Task Completion Rate
* Time Tracking Integration
* Export Reports (PDF, Excel)

4. User Management

* Account Registration/Login
* Role Management (Admin, Member, Viewer)
* Permissions and Access Control

5. Project Settings and Administration

* Create/Edit/Delete Projects
* Configure Project Visibility (public/private)
* Invite/Remove Members
* Set Deadlines and Milestones

**Why Top-Down Works Well Here:**

* **System-wide planning** is critical to avoid integration issues later (e.g., ensuring reports align with tracked task data).
* High-level features like reporting and collaboration rely on structured input from lower-level modules like task tracking.
* It's important to **define the interfaces and workflow between components early**, which is a strength of the top-down approach.

**Problem 2: Online Health Monitoring System**

**Problem Statement**:

Decompose the creation of an online health monitoring system that tracks physical activity, sleep, and heart rate. Decide which approach (top-down or bottom-up) is more suitable and explain why.

**Instructions**:

1. Identify the main goal of the system.
2. Select the top-down or bottom-up approach based on the problem requirements.
3. Identify and break down the system into features and tasks.
4. Explain why the chosen approach is appropriate.

**Main Goal:**

To develop an **online health monitoring system** that tracks users’ **physical activity**, **sleep patterns**, and **heart rate**, providing insights for improved health and well-being.

**Chosen Approach: Bottom-Up**

**Reason for Choosing Bottom-Up:**

* The system consists of **independent sensor-based modules** (e.g., activity tracker, sleep tracker, heart rate monitor) that can function individually.
* Each module deals with **specific data inputs and logic**, which can be built and tested separately.
* Final integration into a unified platform can happen once the modules are stable.
* Flexibility is needed to adapt to different **hardware APIs** or **data sources**.

**Bottom-Up Breakdown:**

**Step 1: Build and Test Individual Modules**

**1. Physical Activity Module**

* Collect step count, distance, and calories burned from wearable sensors
* Process data to detect walking, running, sedentary periods
* Store activity data with timestamps
* Display daily/weekly summaries

**2. Sleep Tracking Module**

* Monitor sleep duration and phases (light, deep, REM)
* Detect bedtime and wake-up time automatically
* Analyze sleep consistency and interruptions
* Provide visual sleep reports

**3. Heart Rate Monitoring Module**

* Collect real-time heart rate data (BPM)
* Track resting, active, and recovery heart rate
* Detect anomalies (e.g., tachycardia, bradycardia)
* Send alerts if abnormal values persist

**Step 2: Integrate Modules into a Unified System**

* **User Profile Management**: Collect age, weight, goals for personalization
* **Dashboard Interface**: Combine metrics from all modules for a holistic view
* **Data Syncing**: Sync across devices or cloud storage
* **Export and Sharing**: Allow users to share data with health professionals
* **Analytics and Recommendations**: Use trends to suggest actions (e.g., increase activity)

**Why Bottom-Up Works Well Here:**

* The system deals with **hardware integration and real-time data**, which benefits from **incremental development**.
* Modules are **loosely coupled**, so they can be built and refined independently.
* Early testing of each module ensures **reliability** before combining them.
* Allows easier **feature extension** (e.g., adding blood pressure tracking later).