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).