Question 1

a. Describe the concept of research and its relevance in both academic and professional settings, providing a concise overview.

b. Outline the five categories of computing project types discussed in the course, highlighting their unique features and practical uses.

c. Contrast bottom-up and top-down development approaches, outlining the pros and cons of each methodology

Question 2

a)

i. Classify the different types of research and clarify their differences.

ii. Provide an overview of the various research methods available to researchers.

b. Identify and succinctly explain the roles and contributions if three stakeholders engaged in your final year project.

c. Discuss the possible obstacles related to industry-based projects in computing, offering at least three instances and strategies for addressing these challenges

**Question 1**

**a. Concept of Research and its Relevance**

* **Concept:**  
  Research is a systematic and scientific process of investigating a problem, generating new knowledge, or validating existing knowledge through data collection, analysis, and interpretation.
* **Relevance:**
  + **Academic Setting:**
    - Builds knowledge base and theories.
    - Helps students and scholars develop critical thinking.
    - Provides evidence for academic discussions.
  + **Professional Setting:**
    - Solves real-world problems in industries.
    - Informs decision-making and policy formulation.
    - Supports innovation (e.g., developing new IT systems).

**b. Five Categories of Computing Project Types**

1. **Software Development Projects**
   * Feature: Involves creating new applications or improving existing ones.
   * Use: Building a student information management system.
2. **System Implementation Projects**
   * Feature: Adapting or integrating existing software into an organization.
   * Use: Deploying ERP systems in a company.
3. **Research-Oriented Projects**
   * Feature: Focus on investigating theories, technologies, or methodologies.
   * Use: Studying AI techniques for fraud detection.
4. **Feasibility Study Projects**
   * Feature: Assess technical, financial, and operational viability before implementation.
   * Use: Evaluating whether blockchain is practical for a hospital’s records.
5. **Simulation/Modeling Projects**
   * Feature: Use models to simulate scenarios for analysis.
   * Use: Simulating network traffic to test cybersecurity resilience.

**c. Bottom-Up vs Top-Down Development**

* **Bottom-Up Approach**
  + **Concept:** Development starts with building small modules, then integrating them into a complete system.
  + **Pros:**
    - Encourages code reusability.
    - Modules are tested independently.
    - Flexible and adaptable.
  + **Cons:**
    - Integration can be complex.
    - Lacks early visualization of the full system.
* **Top-Down Approach**
  + **Concept:** Starts with system design at the top level, breaking it into smaller subcomponents.
  + **Pros:**
    - Clear system overview from the start.
    - Easier project management.
    - Good for large structured projects.
  + **Cons:**
    - May overlook low-level details early.
    - Changes at later stages are costly.

**Question 2**

**a (i). Types of Research**

1. **Basic (Pure) Research** – Expands knowledge without direct application.
2. **Applied Research** – Solves specific, real-world problems.
3. **Quantitative Research** – Focuses on numerical data and statistical analysis.
4. **Qualitative Research** – Focuses on subjective experiences and meanings.
5. **Mixed Methods Research** – Combines both quantitative and qualitative approaches.

**a (ii). Overview of Research Methods**

1. **Experimental Method** – Manipulating variables to test cause-effect relationships.
2. **Survey Method** – Using questionnaires/interviews to gather data.
3. **Case Study** – In-depth investigation of a single unit (organization, system).
4. **Action Research** – Research done while solving a real problem collaboratively.
5. **Observational Method** – Collecting data by directly observing subjects.
6. **Archival/Secondary Research** – Using existing data, records, or literature.

**b. Roles of Three Stakeholders in a Final Year Project**

1. **Student (Researcher/Developer)**
   * Role: Conducts research, develops the project, analyzes results.
   * Contribution: Main driver of the project work.
2. **Supervisor (Lecturer/Advisor)**
   * Role: Guides, reviews, and provides feedback.
   * Contribution: Ensures academic rigor and relevance.
3. **Industry Partner/End User (if applicable)**
   * Role: Provides real-world context, requirements, or data.
   * Contribution: Validates project’s practicality and usability.

**c. Possible Obstacles in Industry-Based Projects (and Solutions)**

1. **Data Access Restrictions**
   * Challenge: Companies may not share sensitive data.
   * Solution: Use anonymized datasets or simulate data.
2. **Time Constraints**
   * Challenge: Balancing academic timelines with industry schedules.
   * Solution: Define realistic scope and milestones early.
3. **Resource Limitations**
   * Challenge: Lack of adequate computing infrastructure or funding.
   * Solution: Use open-source tools, cloud services, or scaled-down prototypes.