PROBLEM STATEMENT: The problem of designing in autonomous drones or robots for search and rescue missions in disaster-stricken areas.

1. Description:

In disaster-stricken areas, traditional search and rescue operations can be hampered by various challenges such as hazardous conditions, unstable structures, and limited access. Autonomous drones or robots can provide a solution by navigating these environments, locating survivors, and relaying critical information to rescue teams.

2. Solution/Approach:

The proposed solution involves the development of autonomous drones or robots equipped with advanced sensing, navigation, and communication capabilities. These robots should be able to perform the following tasks:

- Environment Mapping: The drones or robots should be equipped with LiDAR, cameras, and other sensors to create detailed maps of the disaster area and identify potential hazards.

- Survivor Detection: AI algorithms can be used to analyse sensor data and identify signs of human presence, such as heat signatures or sounds.

- Obstacle Avoidance: The robots should be capable of avoiding obstacles and navigating through debris, rubble, and confined spaces.

- Communication: The robots should establish a reliable communication link with the rescue teams to transmit real-time data and images.

- Path Planning: Advanced path planning algorithms should be used to optimize the routes for the drones/robots to cover the area efficiently.

- Autonomous Decision-Making: The robots should be able to make real-time decisions based on changing conditions and adapt to unforeseen challenges.

3. Technology Stack:

- Sensors: LiDAR, cameras (RGB and thermal), microphones, gas sensors, etc.

- **Processing and AI:** High-performance processors for real-time data analysis and AI algorithms for object detection, path planning, and decision-making.

- Communication: Long-range communication modules (e.g., satellite or mesh networks) for relaying information to rescue teams.

- Navigation: Simultaneous Localization and Mapping (SLAM) algorithms for mapping the environment, and localization techniques (e.g., GPS, Visual SLAM).

- Power Supply: Efficient batteries or power sources to ensure extended operation.

- **Mechanical Design:** Rugged and durable designs that can withstand harsh conditions and obstacles.

4. Architectural Diagram: