**Automatic Dust Bin System – Project Report**

**Stage 1 – Programming & Debugging (40 Marks)**

**Problem Statement (5 Marks):**  
Design and implement an Automatic Dustbin system that detects nearby object movement and opens the lid accordingly using OpenCV and actuators.

**Solution Model / Architecture (15 Marks):**

* Input: Camera detects hand or Colour for the waste bin.
* Processing: Python and Microcontroller (Arduino Uno) processes input.
* Output: Servo motor opens lid; OLED + Dot matrix displays status.

**Circuit Diagram:**  
(Include Arduino + OLED + Servo + MAX7219 wiring)

A circuit board with wires

AI-generated content may be incorrect.

**Algorithm, Coding & Online Evaluation (20 Marks):**

* Algorithm:
  1. Initialize system (OLED, Servo, MAX7219).
  2. Wait for input (colour detection).
  3. If detected → open bin (servo rotates).
  4. Display waste type on LED matrix + OLED stats.
  5. Auto close after delay.
* Codes:

1. **dustbin\_arduino.ino (servo, OLED, MAX7219 logic)**

A screenshot of a computer program

AI-generated content may be incorrect.

A screenshot of a computer program

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A screen shot of a computer program

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1. **object\_detection.py (color-based detection via camera → serial to Arduino)**

A screen shot of a computer program

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A screen shot of a computer code

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**Stage 2 – Hardware Assembly (40 Marks)**

**Problem Statement (5 Marks):**  
Develop a working prototype that integrates sensors, microcontroller, servo motor, OLED, and MAX7219 displays.

**Hardware Building (10 Marks):**

* Arduino Uno
* Servo motors (2x)
* OLED display (128x64)
* MAX7219 8×8 dot matrix (2x)
* Jumper wires, breadboard, power supply

**Deployment of Code (10 Marks):**

* Arduino IDE used for .ino file
* Python with OpenCV for object detection
* Serial communication between PC → Arduino

**Results & Demo (15 Marks):**

* When green object → Wet bin opens
* When blue object → Dry bin opens
* OLED updates count of people, dry, wet
* MAX7219 shows bin activity

**Stage 3 – Documentation (20 Marks)**

**Goal (2 Marks):**  
To design a smart, touch-free, automatic dustbin that improves hygiene, reduces contact-based infections, and enhances waste segregation efficiency.

**Solution Model (2 Marks):**  
A microcontroller-based embedded system using servos, sensors, and displays for automatic waste bin operation.

**Solution Overview / Architecture (3 Marks):**

* Input → Colour/Object detection
* Controller → Arduino Uno
* Output → Servo (bin lid) + OLED (stats) + Dot Matrix (status)

**Resources Involved (2 Marks):**

* Hardware: Arduino Uno, Servos, OLED, MAX7219, Sensors
* Software: Arduino IDE, Python, OpenCV

**Software (3 Marks):**

* C++/Arduino for embedded control
* Python for vision-based detection

**Hardware (3 Marks):**

* Servo control for bin opening
* MAX7219 LEDs for waste indication

**Results (3 Marks):**

* Successfully detects objects
* Opens correct bin
* Updates stats in real-time

**Inference Report (2 Marks):**

* **Features:** Touch-free, real-time detection, dual-bin segregation
* **Issues:** Servo power fluctuations, display timing sync
* **Challenges:** Calibrating colour thresholds, ensuring stable power