

## Daftar Isi

|                                                         |      |
|---------------------------------------------------------|------|
| <b>LEMBAR PENGESAHAN</b> .....                          | i    |
| <b>LEMBAR ORISINALITAS</b> .....                        | ii   |
| <b>ABSTRAK</b> .....                                    | iii  |
| <b>KATA PENGANTAR</b> .....                             | v    |
| <b>Daftar Isi</b> .....                                 | vi   |
| <b>Daftar Gambar</b> .....                              | viii |
| <b>Daftar Tabel</b> .....                               | ix   |
| <b>BAB I PENDAHULUAN</b> .....                          | 1    |
| 1.1. Latar Belakang.....                                | 1    |
| 1.2. Perumusan masalah.....                             | 5    |
| 1.3. Tujuan dan Manfaat .....                           | 5    |
| 1.4. Batasan masalah / ruang lingkup.....               | 6    |
| 1.5. Metode Penelitian.....                             | 6    |
| <b>BAB II TINJAUAN PUSTAKA DAN LANDASAN TEORI</b> ..... | 9    |
| 2.1. Tinjauan pustaka .....                             | 9    |
| 2.2. Landasan teori .....                               | 14   |
| 2.2.1. Kura-kura Brazil.....                            | 14   |
| 2.2.2. Arduino IDE .....                                | 15   |
| 2.2.3. IoT ( <i>internet of things</i> ) .....          | 16   |
| 2.2.4. ESP32 WROOM-32.....                              | 16   |
| 2.2.5. Arduino IoT cloud .....                          | 18   |
| 2.2.6. Sensor Suhu DS18B20 .....                        | 18   |
| 2.2.7. Sensor pH SKU SEN0161 .....                      | 19   |
| 2.2.8. Sensor Turbiditas SKU SEN0189 .....              | 20   |
| 2.2.9. Relay .....                                      | 21   |
| 2.2.10. Turtle tub .....                                | 21   |
| 2.2.11. Kalibrasi sensor .....                          | 22   |
| 2.2.12. Lampu UVA/UVB.....                              | 22   |
| 2.2.13. Fritzing .....                                  | 23   |
| 2.2.14. Modul Step Down LM2596 DC .....                 | 24   |
| 2.2.15. Activity Diagram.....                           | 25   |
| <b>BAB III PERANCANGAN SISTEM</b> .....                 | 26   |

|                       |                                                                            |           |
|-----------------------|----------------------------------------------------------------------------|-----------|
| 3.1.                  | Subjek dan Objek Penelitian.....                                           | 26        |
| 3.1.1.                | Subjek penelitian .....                                                    | 26        |
| 3.1.2.                | Objek Penelitian.....                                                      | 26        |
| 3.2.                  | Alat dan bahan penelitian.....                                             | 27        |
| 3.2.1.                | Alat .....                                                                 | 27        |
| 3.2.2.                | Bahan.....                                                                 | 27        |
| 3.3.                  | Diagram Alir Penelitian.....                                               | 27        |
| 3.3.1.                | Pengumpulan Kebutuhan .....                                                | 29        |
| 3.3.2.                | Membangun <i>Prototyping</i> .....                                         | 29        |
| 3.3.3.                | Evaluasi <i>Prototyping</i> .....                                          | 32        |
| 3.3.4.                | Pengujian Program .....                                                    | 32        |
| 3.3.5.                | Evaluasi Sistem .....                                                      | 32        |
| <b>BAB IV</b>         | <b>HASIL PERCOBAAN DAN ANALISIS.....</b>                                   | <b>36</b> |
| 4.1.                  | Pengumpulan Kebutuhan Sistem .....                                         | 36        |
| 4.2.                  | Membangun <i>Prototyping</i> .....                                         | 37        |
| 4.3.                  | Evaluasi <i>Prototype</i> .....                                            | 38        |
| 4.4.                  | Mengkodekan Sistem.....                                                    | 39        |
| 4.4.1.                | Inisialisasi Pin dan Objek Sensor .....                                    | 40        |
| 4.4.2.                | penghubung utama antara perangkat keras (ESP32 + sensor) dengan cloud .... | 40        |
| 4.4.3.                | Setup Awal .....                                                           | 43        |
| 4.4.4.                | Fungsi Loop .....                                                          | 43        |
| 4.4.5.                | Kalibrasi Sensor pH.....                                                   | 44        |
| 4.4.6.                | Pemrosesan Sensor Turbidity .....                                          | 45        |
| 4.4.7.                | Pemrosesan Suhu dari DS18B20.....                                          | 45        |
| 4.4.8.                | Kendali Lampu Otomatis via Relay.....                                      | 46        |
| 4.5.                  | Pengujian Sistem .....                                                     | 46        |
| 4.5.1.                | Hasil Pengujian Dashboard Web.....                                         | 46        |
| 4.5.2.                | Hasil Pengujian Alat .....                                                 | 49        |
| 4.6.                  | Evaluasi Sistem .....                                                      | 54        |
| 4.7.                  | Penggunaan Sistem .....                                                    | 54        |
| <b>BAB V</b>          | <b>KESIMPULAN DAN SARAN .....</b>                                          | <b>55</b> |
| 5.1.                  | Kesimpulan .....                                                           | 55        |
| 5.2.                  | Saran .....                                                                | 55        |
| <b>DAFTAR PUSTAKA</b> | <b>.....</b>                                                               | <b>58</b> |
| <b>LAMPIRAN</b>       | <b>.....</b>                                                               | <b>62</b> |