| Method | Transfer Function | PID parameters | Time  domain  specs | ITAE |
| --- | --- | --- | --- | --- |
| 1.  GA | 5  -----------------------  sˆ{2.3}+1.3sˆ{0.9}+1.25 | Kp=1.75  Ki=8.51  Kd=3.63  lam=0.63  mu=0.95 | tr=0.2241  ts=1.8496  O%=11.1550 | 94.3132 |
| ACO | 5  -----------------------  sˆ{2.3}+1.3sˆ{0.9}+1.25 | Kp=6.8  Ki=9.57  Kd=9.26  lam=0.90982  mu=0.97523 | tr= 0.1584  ts=0.5176  O%=4.4081 | 3.6342 |
| Enhanced  Ant GA | 5  -----------------------  sˆ{2.3}+1.3sˆ{0.9}+1.25  **Calculated Ant parameters:**  α=1.03 β=0.01 ρ=0.18 | Kp=0.07  Ki=8.51  Kd=9.81  lam=0.7136  mu=0.98811 | tr=0.1620  ts=0.3724  O%=2.2403 | 26.6979 |
| 2  GA | 1  -----------------------  0.8sˆ{2.2}+0.5sˆ{0.9}+1 | Kp=0.87  Ki=5.59  Kd=4.71  lam=0.91  mu=0.83 | tr=0.4396  ts=3.3795  O%=9.5045 | 9.3791 |
| ACO | 1  -----------------------  0.8sˆ{2.2}+0.5sˆ{0.9}+1 | Kp=1.53  Ki=5.75  Kd=5.3  lam=0.98712  mu=0.76117 | tr= 0.4046  ts=3.1152  O%=13.0030 | 7.0422 |
| Enhanced  Ant GA | 1  -----------------------  0.8sˆ{2.2}+0.5sˆ{0.9}+1  **Calculated Ant parameters:**  α=0.69 β=0.17 ρ=0.93 | Kp=1.41  Ki=7.41  Kd=6.92  lam=0.97324  mu=0.91676 | tr=0.3564  ts=2.6900  O%=4.4471 | 8.2715 |
| 3  GA | s+1  ---------------------------------  10sˆ{3.2}+185sˆ{2.5}+288sˆ{0.7}+1 | Kp=8.0700  Ki=4.8300  Kd=4.7500  lam= 0.8700  mu=0.1500 | tr=17.8544  ts=80.2860  O%=21.4689 | 8.3768E+03 |
| ACO | s+1  ---------------------------------  10sˆ{3.2}+185sˆ{2.5}+288sˆ{0.7}+1 | Kp=8.26  Ki=9.76  Kd=8.57  lam=0.64225  mu=0.03973 | tr=17.9961  ts=92.1726  O%=7.5026 | 2.46E+03 |
| Enhanced  Ant GA | s+1  ---------------------------------  10sˆ{3.2}+185sˆ{2.5}+288sˆ{0.7}+1  **Calculated Ant parameters:**  α=1.71 β=0.03 ρ=1.71 | Kp=9.91  Ki=8.34  Kd=6.7  lam=0.78495  mu=0.81468 | tr=14.8951  ts=69.5422  O%=17.1611 | 6.4081E+03 |
| 4  GA | 5sˆ{0.6}+2  ---------------------------------------------  sˆ{3.3}+3.1sˆ{2.6}+2.89sˆ{1.9}+2.5sˆ{1.4}+1.2 | Kp=1.01  Ki=6.21  Kd=4.05  lam=0.59  mu=0.99 | tr=0.3957  ts=4.9944  O%=14.6938 | 282.7508 |
| ACO | 5sˆ{0.6}+2  ---------------------------------------------  sˆ{3.3}+3.1sˆ{2.6}+2.89sˆ{1.9}+2.5sˆ{1.4}+1.2 | Kp=5.46  Ki=4.6  Kd=6.85  lam=0.96829  mu=0.94351 | tr=0.2936  ts=1.5973  O%=11.8970 | 19.742 |
| Enhanced  Ant GA | 5sˆ{0.6}+2  ---------------------------------------------  sˆ{3.3}+3.1sˆ{2.6}+2.89sˆ{1.9}+2.5sˆ{1.4}+1.2  **Calculated Ant parameters:**  α=0.58 β=0.02 ρ=0.02 | Kp=5.78  Ki=5.78  Kd=9.26  lam=0.90982  mu=0.97523 | tr=0.2554  ts=0.9952  O%=8.6115 | 27.0871 |
| 5  GA | 1  -------------------------------  sˆ{2.3}+3.2sˆ{1.4}+2.4sˆ{0.9}+1 | Kp=2.55  Ki=5.75  Kd=6.39  lam=0.67  mu=0.67 | tr=1.0054  ts=4.2681  O%=4.3268 | 44.2226 |
| ACO | 1  -------------------------------  sˆ{2.3}+3.2sˆ{1.4}+2.4sˆ{0.9}+1 | Kp=9.6  Ki=6.45  Kd=9.64  lam=0.85631  mu=0.42027 | tr=0.5181  ts=1.7633  O%=9.8186 | 42.6461 |
| Enhanced  Ant GA | 1  -------------------------------  sˆ{2.3}+3.2sˆ{1.4}+2.4sˆ{0.9}+1  **Calculated Ant parameters:**  α=1.3 β=0.34 ρ=1.86 | Kp=9.17  Ki=3.72  Kd=7.84  lam=0.96333  mu=0.60955 | tr=0.6554  ts=0.9715  O%=0.5430 | 11.9839 |