

Medium Deputy Executive Engineer (Electricity) 2026 Gujarat Public Service Commission / Assistant Engineer (Electrical) 2026 Gujarat Public Service Commission

PID

- A

1, 2, 3
- B

1, 3
- C

1, 2, 3

Correct
- D

Correct Answer: C

Full Detailed Explanation

Proportional, Integral, and Derivative

Proportional (P) control is the simplest form of feedback control. It adjusts the output based on the current error (the difference between the setpoint and the process variable). The output is directly proportional to the error. The transfer function for a P controller is $G_c(s) = K_p$, where K_p is the proportional gain. The output of a P controller is $u(t) = K_p e(t)$, where $e(t)$ is the error signal. P control can reduce the steady-state error but cannot eliminate it completely. It also cannot handle disturbances that change the setpoint or the process parameters. Integral (I) control is used to eliminate the steady-state error. It integrates the error over time and adjusts the output based on the integral of the error. The transfer function for an I controller is $G_c(s) = K_i / s$, where K_i is the integral gain. The output of an I controller is $u(t) = K_i \int e(t) dt$. I control can eliminate the steady-state error but can cause the system to become unstable if the gain is too high. Derivative (D) control is used to improve the system's response time and reduce overshoot. It adjusts the output based on the rate of change of the error. The transfer function for a D controller is $G_c(s) = K_d s$, where K_d is the derivative gain. The output of a D controller is $u(t) = K_d de(t)/dt$. D control can improve the system's response time but can also amplify high-frequency noise. A combination of P, I, and D control is called PID control. The transfer function for a PID controller is $G_c(s) = K_p + K_i/s + K_d s$. PID control can provide a good balance between reducing steady-state error, improving response time, and reducing overshoot. The gains K_p , K_i , and K_d are tuned to achieve the desired system performance. The output of a PID controller is $u(t) = K_p e(t) + K_i \int e(t) dt + K_d de(t)/dt$. PID control is widely used in industrial processes and control systems.