**ANSWER KEY - LABORATORY EXERCISE 9**
**PID TUNING FROM OPEN LOOP TESTS**


2.      OPEN LOOP TESTING

NOTE:  Some persons may use the GENERIC2 model for Laboratory
Exercises 3 and 4, rather than the suggested GENERIC model.
Hence, data is given for both models.

<div align="center">PROCESS MODEL</div>

|  | GENERIC | | | GENERIC2 | | |
|---|---|---|---|---|---|---|
| Process Gain | 1.5 | | | 1.5 | | |
| Dead Time | 2.0 mins | | | 4.0 mins | | |
| Time Constant | 7.0 mins | | | 8.0 mins | | |
| | P | PI | PID | P | PI | PID |
| Gain (Kc) | 2.33 | 2.1 | 2.8 | 1.33 | 1.2 | 1.6 |
| Prop Band (PB) | 43% | 48% | 36% | 75% | 83% | 63% |
| Integ Time (Ti) Mins/Rpt | ___ | 6.67 | 4.0 | ___ | 13.3 | 8.0 |
| Reset Rate Rpts/Min | ___ | 0.15 | 0.25 | ___ | 0.075 | 0.125 |
| Deriv Time  (TD) | ___ | ___ | 1.0 | ___ | ___ | 2.0 |
| Decay Ratio | 0.10 | 0.183 | 0.062 | 0.33 | 0.385 | 0.174 |
| Period, mins | 12.6 | 14.0 | 15.0 | 21.0 | 24.0 | 18.0 |
| Period/Integ Time | ___ | 2.1 | ___ | ___ | 1.80 | ___ |

For the P-only controller, the eventual settling value was 313.9, compared with a Set Point of 325.  Therefore the decay ratio was figured from overshoots above 313.9.

For the P-only controller, the eventual settling value was 308.0, compared with a Set Point of 325.  Therefore the decay ratio was figured from overshoots above 308.0.

Set Point response:                    PID

Load (disturbance) response:           PID

Added process measurement noise:

Measurement noise causes greatly amplified controller output movement when using derivative.

Added measurement filter:

Effect of derivative and measurement noise on controller output is somewhat diminished.