ANSWER KEY - LABORATORY EXERCISE 16
CHARACTERISTICS OF ADDITIVE FEEDFORWARD CONTROL

3. TESTING THE PROCESS

Testing for the "A" transfer function:

Change in load (Delta U)	20 GPM = 5%
Change in measurement (Delta x)	17 DegF = 3.4%
Process gain through A path.	0.68
Observed dead time	5 minutes
Observed time constant	10.2 minutes

$$A(S) = \frac{0.68 \exp(-5s)}{10.2s + 1}$$

Testing for the "B" transfer function:

Change in manip variable (Delta m)	10 KCFH = 10%
Change in measurement (Delta x)	98 DegF = 19.6%
Process gain through B path	1.96
Observed dead time	3.25 minutes
Observed time constant	7.5 minutes

$$B(s) = \frac{1.96 \exp(-3.25s)}{7.5s + 1}$$

4. DETERMINATION OF FEEDFORWARD CONTROLLER TUNING VALUES

$$FF(S) = \frac{0.35 (7.5s + 1) \exp(-1.75s)}{10.2s + 1}$$

Kf = 0.35

Tld = 7.5 minutes

Tlg = 10.2 minutes

Tdt = 1.75 minutes

5. TESTING THE FEEDFORWARD CONTROLLER

Discernible change Yes

Final feedforward tuning values:

Kf = 0.38

Tld = 6.8 minutes

Tlg = 10.2 minutes

Tdt = 1.50 minutes

Maximum deviation: 0.17 degF

6. ADDING FEEDBACK

Gain 1.38

Reset 10.8 minutes/repeat

Does the process come to set point? Yes

Final feedback tuning values:

Gain 1.0

Reset 10.8 minutes/repeat

Feedforward control action? Most of it

Feedback control action? Very little

7. A LOOK AT ADDITIVE FEEDFORWARD WITH MORE DEVIATION FROM NORMAL OPERATING POINT

Is the response okay?	Yes
At 9S% process flow	Slightly more sluggish
At lower process flows	Very oscillatory