Problem 9A and problem 9B will be graded at 2.0 points each, point breakdown is shown below

PROBLEM 9A Power Systems

Given the three generating unit heat rate functions, generator limits and fuel costs below:

UNIT 1: $H_1(P_1) = 1000 + 20P_1 + 0.08P_1^2$ MBtu/Hr (P_1 is in MW)

where: $40 \le P_1 \le 800MW$

and unit 1 fuel cost is 0.5 $/MBtu

UNIT 2: $H_2(P_2) = 1500 + 2P_2 + 0.1P_2^2$ MBtu/Hr (P_2 is in MW)

where: $200 \le P_2 \le 500MW$

and unit 2 fuel cost is 0.1 $/MBtu

UNIT 3: $H_3(P_3) = 1300 + 10P_3 + 0.05P_3^2$ MBtu/Hr (P_3 is in MW)

where: $100 \le P_3 \le 600MW$

and unit 3 fuel cost is 0.55 $/MBtu

Question 9A

(a) [0.8 points] Solve for the economic dispatch of these three units when they are supplying a total load of 1200 MW. Assume all generators are on line.

(b) [0.8 points] Indicate which if any of the generators are at their minimum or maximum output

(c) [0.4 points] Calculate the incremental (marginal) cost or Lambda for this dispatch

PROBLEM 9B Power Electronics

A Buck-Boost dc-dc converter is operating in dc steady state under the following conditions: $V_{in} = 5V$, $V_o = 12V$, $P_o = 24W$, and $f_s = 250kHz$. In the inductor current, peak-to-peak ripple $\Delta I_{L,pp} = 1.5A$. Assume ideal components and the output filter capacitor to be very large such that $v_o(t) \simeq V_o = 12V$.

Question 9B:

(a) [0.4 points] Calculate the value of the inductor L

draw and completely label the waveforms for

(b) [0.4 points] the voltage across the inductor,

(c) [0.4 points] the input current,

(d) [0.4 points] the current through the diode

(e) [0.4 points] the current through the output filter capacitor.