Problem 01.

Reflections:

This question allowed me to understand how to try and solve a practical problem involving a compound differential manometer. The given information was the fluid densities and column heights for each of the fluids, we then can calculate the pressure difference between two points in the system. The key takeaways for me from this question are to better understand the hydrostatic pressure equation. To solve for this equation, we need to know product of fluid density, gravitational acceleration, and the difference in height between the points.

Criteria	**Value**	**Assigned**
Use gamma*h technique to get deltap?	1	1
Consider that pressure in trapped air is constant?	1	1
Correct use of values with units?	1	.5
Correctly considered all fluid levels after oil column goes to 5”?	1	1
Use same equation for deltap?	1	1
Final correct results?	*1*	.5
TOTAL	6	5

Problem 02.

Reflections:

Problem 02 involved solving for the forces on the gate, hinge, and support system. So, the assumption from the drawing is that the system in in equilibrium. Once the correct equations where used we needed to create an Excel spreadsheet to analyze the forces acting on a gate submerged in two different fluids. By inputting the depths of the fluids and their specific gravities, the spreadsheet should calculate the net force on the gate, the force at the hinge, and the force at the support. Additionally, we needed plot a graph of the force at the hinge versus the elevation of the liquid on one side of the gate. This exercise helped to understand the principles of hydrostatic pressure and force equilibrium in fluid mechanics, as well as practicing data analysis and visualization skills using Excel.

Criteria	**Value**	**Assigned**
Use correct fluid forces equation?	1	1
Correct equation for gate force?	1	1
Sum of moment to get force at support (or hinge)? Need correct fluid force location	1	.5
Sum of forces to get force at hinge (or support)?	1	1
Correct setup of excel spreadsheet?	1	.5
Final correct results?	1	1
Final correct plots? One per different cyl diam?	1	.5
TOTAL	7	5.5

Problem 03.

Reflections:

I gained insights into how buoyant forces work and how they're calculated. This problem helped me to understand the upward force exerted on an object immersed in a fluid, which is crucial for evaluating stability of an object in a fluid. Additionally, I got a better understanding of the concept of the center of buoyancy, which is the centroid of the displaced fluid volume. In this problem the shape a cylinder, the center of buoyancy is at the geometric center of the submerged portion. The metacenter is a key point in evaluating stability, for a cylinder with its axis vertical, the metacenter is at the same height as the center of buoyancy. Comparing the distance between the metacenter and the center of gravity helps us determine the stability of the system. If the metacenter is above the center of gravity, the system is stable; if below, it's unstable.

Criteria	Value	Assigned
Correct eq for submerged distance into the fluid? Use Fb=W	1	.75
Correct eqs for locations of center of gravity and center of buoyancy?	1	.75
Correct eq for distance to metacenter from center of buoyancy?	1	.75
Compare metacenter location to center of gravity location?	1	.75
Correct setup of excel spreadsheet?	1	.75
Final correct results (stable?)	1	.75
Final correct plots? One per different cyl diam?	1	.75
TOTAL	7	5.25

(90/3)*(5/6 + 5.5/7 + 5.25/7) = Final

(90/3)*(.8333 + .7858 + .7500) = Final

(90/3)*(2.3670) = 63.57 ~ 71%

Final = 71%

Overall Reflection:

In completing the test, I faced several challenges. Originally, I planned to tackle one problem per day over three days, allowing for ample time to review and reflect on the solutions I was submitting. However, I struggled to adhere to this schedule. Instead, I ended up completing the test over the weekend due to a busy workload during the week. This made me feel rushed. Now I realize that I should have stuck to my initial plan for a more measured approach. As for new concepts, I gained a deeper understanding of the engineering principles behind structures like water towers. Observing one now, I appreciate the complexities involved and the forces at play.

Regarding the application of these concepts, I'm assuming that engineers often utilize them in various scenarios. For instance, the hydrostatic pressure equation is of great importance engineering. As for personal application, although I don't foresee myself pursuing a career in engineering post-graduation. I'm currently in the Information Technology field (I'm and Oracle DBA and Data Architect) I still recognize the relevance of learnings and I feel that it contributes to a well-rounded understanding that can be beneficial in problem-solving across other disciplines. I have not been able to apply these concepts in my current work or other courses yet, I am only taking one or two classes per semester. Perhaps in future MET courses, I may find opportunities to apply these principles.

As far as the solutions that where provided, I really didn't get the graphing correct in problem two and three. Also, I didn't understand that in problem three you are also looking for the equations and not just plugged into the spreadsheet. The only advice that I could offer myself would be to read more and do as many problems as possible.