SHEET 2

1- (Example 5-1)
A gear pump has a 3-in outside diameter, a 2-in inside diameter, and a 1-in width. If the actual pump flow rate is 1800 rpm and rated pressure is 108 in^3/s, what is the volumetric efficiency?

2- (Example 5-2)
A gear pump has a 75-mm outside diameter, a 50-mm inside diameter and a 25-mm width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow-rate? The pump speed is 1000 rpm.

3- (Example 5-3)
A vane pump is to have a volumetric displacement of 5 in^3. It has a rotor diameter of 2 in, a cam ring diameter of 3 in, and a vane width of 2 in. What must be the eccentricity?

4- (Example 5-4)
A vane pump has a rotor diameter of 50-mm, a cam ring diameter of 75-mm and a vane width of 50-mm. If the eccentricity is 8-mm, determine the volumetric displacement.

5- (Example 5-5)
A fixed displacement vane pump delivers 1000 psi oil to an extending hydraulic cylinder at 77 in^3/s. When the cylinder is fully extended, oil leaks past its piston at a rate of 2.695 in^3/s. The pressure relief valve setting is 1200 psi. If a pressure-compensated vane pump were used it would reduce pump flow 77 in^3/s to 2.695 in^3/s when the cylinder is fully extended to provide the leakage flow at the pressure relief valve setting of 1200 psi. How much hydraulic power would be saved by using the pressure compensated pump?

6- (Example 5-6)
Find the offset angle for an axial piston pump that delivers 62 in^3/s at 3000 rpm. The pump has nine ½ inch diameter pistons on a 5-in diameter piston circle. The volumetric efficiency is 95%.

7- (Example 5-7)
Find the flow rate in units of L/s that an axial piston pump delivers at 1000 rpm. The pump has nine 15-mm diameter pistons arranged on a 125-mm diameter piston circle. The offset angle is set at 10^0 and the volumetric efficiency is 94%.

8- (Example 5-9)
A pump has a displacement volume of 100 cm^3. It delivers 0.0015 m^3/s at 1000 rpm and 70 bars. If the prime mover input torque is 120 N.m,

a. What is the overall efficiency of the pump?
b. What is the theoretical torque required to operate the pump?

9- (Example 5-10)
The pump of the previous problem is driven by an electric motor having an overall efficiency of 85%. The hydraulic system operates 12 hours per day for 250 days per years. The cost of electricity is $0.11 per kilowatt hour. Determine,

a. The yearly cost of electricity to operate the hydraulic system
b. The amount of the yearly cost of electricity that is due to the inefficiencies of the electric motor and pump