



College of Engineering & Technology

Department: Mechanical Engineering
Lecturer: Dr. Rola Afify
Course Code: ME464

Marks: 20
Time: 8:30 - 10:00
Date: 12/5/2016

20

Name: **Model Answer**

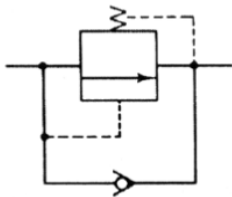
R.N.:

Answer the following questions:

Question one (10 marks)

a) For each valve of the following [choose type (Direction control - Pressure control - Flow control) - draw symbol - write function]:-

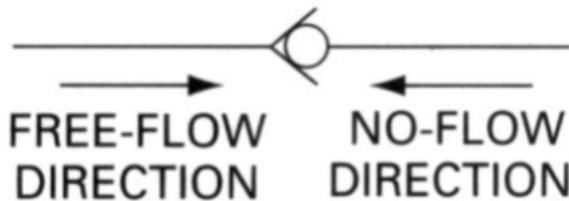
• Counterbalance Valves (CBV)



Pressure control valve

The purpose of a counterbalance valve is to maintain control of a vertical hydraulic cylinder to prevent it from descending due to the weight of its external load.

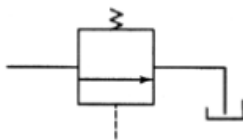
• Check valve



Direction control valve

It permits free flow in one direction and prevent any flow in the opposite direction.

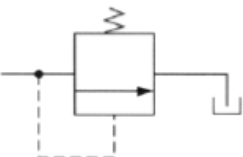
• Unloading valve



Pressure control valve

It permits a pump to build pressure to an adjustable pressure setting and then allows it to discharge oil to the tank at essentially zero pressure as long, as pilot pressure is maintained on the valve from a remote source.

• Relief valve



Pressure control valve

It permits flow through the outlet to the tank as long as this high pressure level is maintained.

• Needle valve



Flow control valve

It regulates the speed of hydraulic cylinders and motors by controlling the flow-rate to these actuators.

Question two (10 marks)

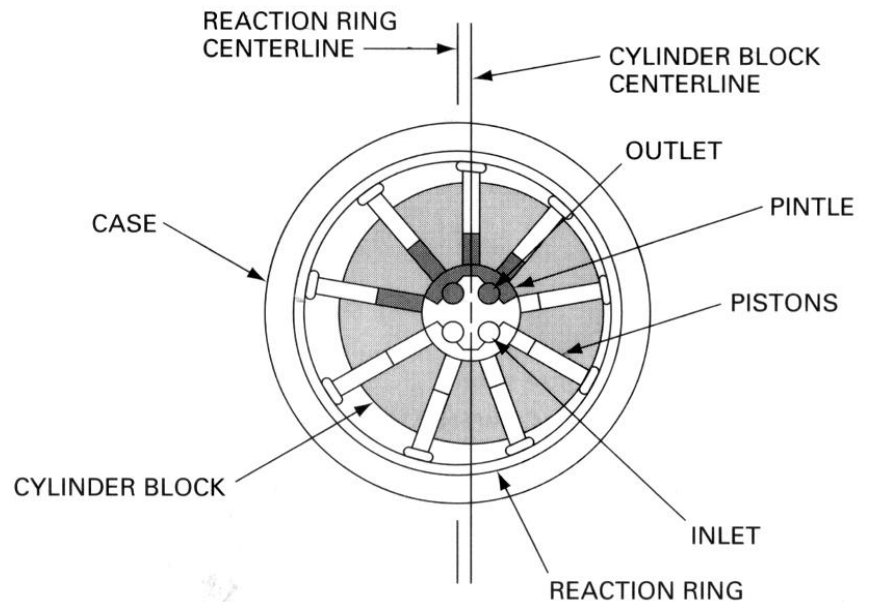
A) A vane pump has a rotor diameter of 50 mm, a cam ring diameter of 75 mm, and a vane width of 50 mm. If the eccentricity is 8 mm, determine the volumetric displacement.

$$V_D = \frac{\pi}{2} (50 + 75)(8)(50) = 78500 \text{ mm}^3 = 7.85 \times 10^{-5} \text{ m}^3$$

B) Compare between Radial Piston Pump and Lobe Pump.

Radial Piston Pump

This Design consists of: A Pintle to Direct Fluid In and Out of the Cylinders, A Cylinder Barrel with Pistons, and A Rotor containing a Reaction Ring. The Pistons Remain in Constant Contact with the Reaction Ring due to Centrifugal Force and Back Pressure on the Pistons. For Pumping Action, the Reaction Ring is Moved Eccentrically with respect to the Pintle or Shaft Axis. As the Cylinder Barrel Rotates, the Pistons on One Side travel outward. This Draws in Fluid as Each Cylinder passes the Suction Ports of the Pintle.



Lobe Pump

Also in the General Family of Gear Pumps is the Lobe Pump, which operates in a Fashion Similar to the External Gear Pump. But Unlike the External Gear Pump, Both Lobes are Driven Externally so that they do Not actually Contact Each Other. Thus, they are Quieter than Other Types of Gear Pumps. Due to the Smaller Number of Mating Elements, the Lobe Pump Output will have a Greater Amount of Pulsation, although its Volumetric Displacement is generally Greater than that for Other Types of Gear Pumps.

