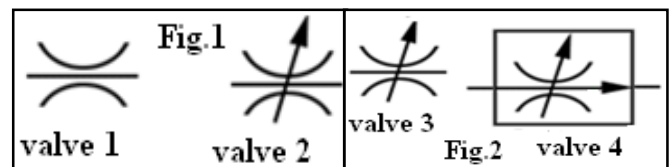


Self-Study **Sheet-6 Part-2, on Chapter-7: Flow Control Valves**

1- Select True (✓) or False (x) for each statement:

#	True	False	statement
1			Flow control valves are used to regulate the volume of oil supplied to different areas of hydraulic circuits.
2			Flow control valve reduces flow rate in its leg of circuit building added resistance to circuit & increases pressure
3			Using flow control valve results in partial bypassing of flow over relief valve or de-stroking of compensated pump
4			Using flowcontrol valve with fixed volume pump is wrong design due to large pressure increase upstream the valve
5			Flow control valves may be fixed or non-adjustable or adjustable. They may be also classified as throttling only or pressure compensated.
6			Flow rate in an orifice will not remain constant as long as pressure differential across the orifice does not change.
7			Changing the load or pressure upstream of flow control valve will change pressure drop and flow across the valve.
8			Needle valves may be designated as non-compensated flow control or throttling valves
9			Needle valves are not good metering devices as long as the pressure differential across the valve remains constant.
10			Pressure compensated flow control valve is designed to make allowances for pressure changes ahead or after orifice
11			In a circuit using a hydraulic cylinder in addition to a pressure compensated flow control valve, the speed of the cylinder does not change with the change in load.
12			A pressure compensated flow control valve may also be temperature compensated as well to allow for change in fluid viscosity due to temperature changes in hydraulic oil.
13			Flow control valves are often used to control the speed of an actuator in a hydraulic cylinder.
14			Pressure compensated flow control valve maintains constant flow by maintaining constant pressure upstream valve
15			Meter-in is placing flow control valve to restrict the fluid flow at the inlet to the actuator.
16			If flow control valve is used to meter-in cylinder-circuit, the valve restricts flow to cylinder, slowing its extend rate.
17			If flowcontrol valve is used to meter-incylinder-circuit,check valve allows return flow to bypass flow control valve
18			Advantage of meter-in is high accuracy with positive load but as negative load overruns, the cylinder will cavitate
19			Meter-in is the best for controlling constant speed of a positive load. It also dampens flow and pressure transients.
20			Meter-out is placing flow control valve to restrict the fluid flow at the outlet from the actuator.
21			Advantage of meter-out is that it prevents cylinder from overrunning and consequently prevents cavitation.
22			Disadvantage of meter-out ispressure intensification due to a substantial differential area ratio between the rod ends
23			As we meter-out on the rod side of the cylinder without a load, the pressure is intensified on the rod side. This may damage the rod seals.
24			The application must determine the type of flow control valve placement if meter-in or meter-out.
25			When metering-in is used, one must always use a pressure compensated flow control.

2-What is the function of flow control valves? Discuss with illustration sketches, the effect of flow reduction on a hydraulic circuit of fixed volume pump and on a circuit with pressure compensated pump.



3- For Fig.1, discuss and compare between **fixed**, **non-adjustable**, and **adjustable** flow control valves.

4- For Fig.2, discuss and compare between **throttling** and **pressure compensated** flow control valves.

5- Define the characteristics of **Needle Valves**. Compare them with **pressure compensated control valves**.

Illustrate this with a hydraulic circuit of double acting cylinder moving very small & very large loads.

6- Explain how **pressure compensated control valves** can be temperature compensated as well?

7- State true or false and explain why? "Flow through a throttling valve will vary if the differential pressure across the valve varies".

8- State true or false and explain why? "A pressure compensated flow control valve maintains a constant flow by maintaining a constant pressure upstream from the valve".

9- Discuss and explain with two different hydraulic circuits the methods of **Meter-in** versus **Meter-out** for flow control. State the advantages and disadvantages of each method in controlling the actuator motion.

***** End of Flow Control Valves *****