SNS COLLEGE OF TECHNOLOGY, COIMBATORE – 35

Department of Mechanical Engineering

Academic Year 2019 -20 EVEN

II year B.E. – Mechanical Engineering IV semester

16ME210 FLUID POWER CONTROL

UNIT - III

1. **What are pressure control valves?**

   Pressure controls valves are used in hydraulic circuits to maintain the desired pressure levels in various parts of the circuits.

2. **How the direction control valves are classified?**

   The direction control valves are mainly classified under two categories.

   1. Sliding spool type 2. Rotary spool type

   They are further classified as one way, two way, three way and four way valves depending upon the port connections available.

3. **List the methods of actuating direction control valves.**

   The direction control valves are actuated by the following methods.

   Manually operated,

   Mechanically operated and Solenoid operated.

   Draw the diagram given in the class notes.

4. **What is an unloading valve?**

   The unloading valve is used to permit a pump to operate at minimum load (Discharged to tank by an external pilot pressure) and is therefore at minimum horsepower.

5. **Define the term "Hydraulic accumulator".**

   A hydraulic accumulator is a device that stores the potential energy of an incompressible fluid held under pressure by an external source against some dynamic force.

6. **What is a sequence valve? What is its purpose?**

   When the operation of two hydraulic cylinders are required to be performed in sequence by using a single direction valve a special valve is required for this purpose and it is known as Sequence valve. The sequence valve is to direct flow in a pre determined sequence.

7. **What is a Servo valve?**

   A servo valve is a direction control valve which has infinite variable positioning capacity. Thus it can control not only the direction of the fluid but also the amount.

8. What is a 3-position, 4-way, closed centre solenoid operated direction control valve? (Ap-May-04)

In 3-position, 4-way,closed centre valve , the valve has another position called neutral position or centre position and this is used when it is necessary to stop or hold the hydraulic actuator at some intermediate point. More over the above valve is controlled by solenoid, which operates the valve with the help of magnetic force.

9. What is the difference between pilot operated and direct operated pressure relief valve? (Ap-May-04)

In direct operated pressure relief valve, the spool is shifted manually by moving a handle, pushing a button, or stepping on a foot pedal. The spool will returns to its original position by means of a spring. Where as in pilot operated type, pilot pressure (either hydraulic or pneumatic) is introduced for pushing the piston to shift the spool.

10. What are control valves?

The valves which are used to control the pressure, flow and direction of fluids are called as control valves.

11. What are the important considerations in hydraulic circuit?

The following three considerations are taken into account

1. Safety of operation 2. Performance of desired function. 3. Efficiency of operation

12. What is the purpose of regenerative circuit?

Regenerative circuit is used to speed up the extension stroke of the double acting hydraulic cylinder. It is possible to get more speed than the retraction stroke if the diameter of rod is so small.

13. Define the function of pressure intensifier.

An intensifier is a device which converts low pressure fluid power into high pressure fluid power

14. What is meant by an air-over-oil system?

Some times circuits using both air and oil are utilized to obtain the advantages of both. The surge tank is pressurized by air and pushes oil out in to the system. This system eliminates the need of the costly hydraulic pump and tank unit. This system is called as air-over-oil system.

15. What are synchronizing circuits?

Many times in hydraulic machines some object or platform is to be lifted with the help of two or more hydraulic cylinders simultaneously. In such cases it becomes absolutely necessary that both cylinders must be synchronized. The circuits designed for these purpose are called as synchronizing circuits.

16. What is the application of counterbalance valve?

A counter balance valve is used to maintain back pressure on a vertical cylinder to prevent it from falling due to gravity. The applications are presses, loaders, lifts, trucks etc.

17. What is a brake valve?

A brake valve actuates the counter balance valve when the back pressure is required. But during the time of actual operation it relieves the unnecessary back pressure induced by the counter balance valve.

18. What is called Meter-out circuit?

The meter-out circuit is commonly used in machine tools that require precise control of the fluid on discharge from the exhaust side of the cylinder. Machine tools like mills and drills employs meter-out circuits.

19. What is automatic cylinder reciprocating system?

The pilot signal shifts the DCV automatically by employing two sequence valves and hence the cylinder reciprocates continuously (Automatically).

20. Write short notes on pump unloading circuit.

In this circuit there are two pumps used viz, High Pressure low flow pump and High Flow low pressure pump. The High Flow pump is responsible for Speedy stroke and High Pressure pump is responsible for taking higher load. In certain circuits like punching press operation, initially the extension stroke speed may be higher (both the pumps are in operation), finally ie., during pressing operation it should take more load (High pressure pump should only be in operation). During pressing the High flow pump is unloaded to tank through unloading valve.

21. What is the component used in fail safe circuit for overload protection?

Emergency cut-off valve is installed in the fail safe circuit for overload protection

22. What is"metre- in" circuit? What is its limitation? (AP-May-04)

The flow control valve is located in the pressure line leading to the work cylinder and hence is called as"metre- in" circuit. The limitation of this type is that the circuit can only be used when the load characteristics are constant and positive.

23. What is the function of intensifier and accumulator in hydraulic circuits?(Ap-May-04)

The function of the intensifier is, which converts low pressure fluid power into high pressure fluid power. The function of the accumulator is to store the potential energy of an incompressible fluid held under pressure.

24. Name the valve used to maintain fluid pressure in hydraulic circuits.

Pressure control valves.

25. List some of the normally closed valves.

Releif, sequence, unloading and counter balance valve are normally closed valves.

26. Give an example of normally open valve.

Check valve.

27. What are direction control valves?

Direction control valves are used to control the direction of flow in hydraulic circuits.

28. How the DC valves are classified?

They are classified in to two categories.

1. Sliding spool type.
2. Rotary spool type.

29. Give an example of two way valve.

Pilot operated check valve.

30. Give an example of one way valve.

Check valve.

31. What is three way direction control valve?

A direction control valve whose primary function is to alternatively pressurize and exhaust one working port is called three way DC valve.

32. List the different positions available in three position four way valves.

Open centre, closed centre and tandem centre are the three positions available.

33. List out the mechanical methods of DCV actuation.

They are Lever type, push button type, pedal type and cam type.

34. Name the Electrical method of DCV actuation.

They are Solenoid operated DCV

35. What is called piloted operated DC valves?

Either air or oil under pressure is applied to DCV to actuate through a pilot line. Hence they are called pilot operated DC valves.

36. What is the disadvantage of counter balance valve?

The disadvantage of counter balance valve is that it reduces the available force.

37. Classify the flow control valves.

The main classification of flow control valves are pressure compensated and non pressure compensated type.

38. List some of non pressure compensated type flow control valves.

Needle valve, Globe valve and Gate valve.

39. What is pressure compensated flow control valve?

The pressure compensated flow control valve automatically adjusts to pressure changes and maintain a constant pressure drop from inlet to outlet.

40. What are the possible locations of flow control valves?

There are three types of locations called Meter-in, Meter-out, and Bleed-off.

41 . What is a modular valve?

Modular valve is a stock of control valves one on the other to form a complete valve pack. This arrangement forms a compact system, thereby reducing assembly cost and eliminates much of the interconnecting pipe work.

42. What is the use of pressure contorl valve?

Pressure control valves are used in hydraulic circuits to maintain the desired pressure levels in various parts of the circuits. Diverting the high pressure fluid to a low pressure area, there by limiting the pressure in the higher pressure area.

43. What are the three basic types of accumulators?

i) Weight loaded (or) gravity type. ii) Spring loaded type iii) Gas loaded type.

44. What are the types of gas loaded accumulators?

i) Non- separator. ii) Separator.

45. Name the major classifications of separator accumulator.

i) Piston type. ii) Diaphragm type. iii) Bladder type.

46. What are the advantages and disadvantages of piston type accumulator?

Advantage: This type of accumulator is its ability to accommodate very high or low temperature of the system.

Disadvantage: The main disadvantages of the free piston type accumulator are its cost and size. Piston and seal friction may also be a problem in a low pressure system.

47. What are the advantages of diaphragm type accumulator?

The greatest advantages of this type of accumulator are its small weight to volume ratio, characteristics that makes it suitable for aircraft application.

48. Bladder type accumulators provide quick pressure response than piston type accumulators. Reason out.

Two reasons,

i. Rubber bladders do not have to overcome the static friction which a piston seal must.
ii. The piston mass does not need to be accelerated and decelerated.

UNIT - III

1. How do a simple pressure reducing valve and compound relief valve differ in operation?
2. Name and explain three major classifications of a separator accumulator.
3. Describe the purpose, construction, and operation of various directional control valves.
4. With neat sketch explain the operations of a pressure- reducing valve. Sketch its graphical symbol
5. Explain in brief about the sequence valve with its application circuit.
6. Describe the purpose, construction, and operation of various flow & pressure control valves.
7. Differentiate between a pressure relief valve, a pressure-reducing valve, a sequence valve and an unloading Valve.
8. Describe the purpose, construction, and operation of various accumulators.
9. Explain the operation of accumulator circuits.
10. Describe the operation of pressure intensifiers and identify typical applications.
11. Explain electrical control solenoid valves, relays & ladder diagram.
12. Construct a hydraulic circuit to explain the application of regenerative system in a drilling machine.
13. Construct a double pump hydraulic circuit employed in a punching press and explain how it functions.
14. While designing the hydraulic circuit what are the important considerations must be taken into account?
15. What is the difference between closed circuit and open circuit hydrostatic transmission.
16. Describe the application of synchronizing circuit for series pumping.
17. Explain in detail about the hydraulic operation of a planning machine.
18. Brief the hydraulic operation of press with neat circuit.
19. Explain the hydraulic circuit for a robotic arm.
20. Draw a hydraulic circuit for forklift.