


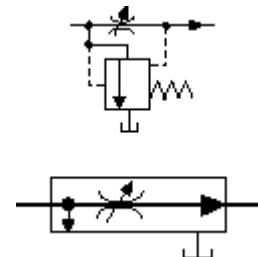
Tanta University	 Hydraulic and pneumatic circuits	4 <sup>th</sup> Year Mech. Power
Faculty of Engineering		Midterm Exam – April, 2015
Mech. Power Engineering Dept.		Full Marks:80, Time: 90 Min.
• Assume any missing data.		

***Answer all the following questions:***

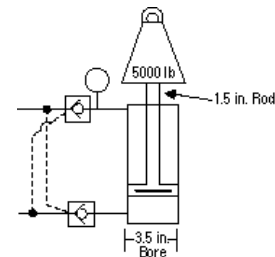
**Question (1): [20 Marks]**

Select the most appropriate answer from the multiple choices given:

- A compound, balanced piston (or spool) pressure relief valve is balanced by:**
  - flow
  - stroke.
  - pressure.
  - spring force.
  - spool size.
- What is adjusted to regulate flow in the pressure compensated, by-pass type, flow control valve illustrated by the symbols shown?**
  - flow orifice.
  - relief to drain.
  - compensator spring.
  - pilot pressure to compensator.
  - vent pressure to compensator.



- If only the piston seal in the figure shown were to leak, theoretically the cylinder rod would:**
  - lock up. completely.
  - drift in. completely.
  - retract completely.
  - leak fluid.
  - remain stationary.

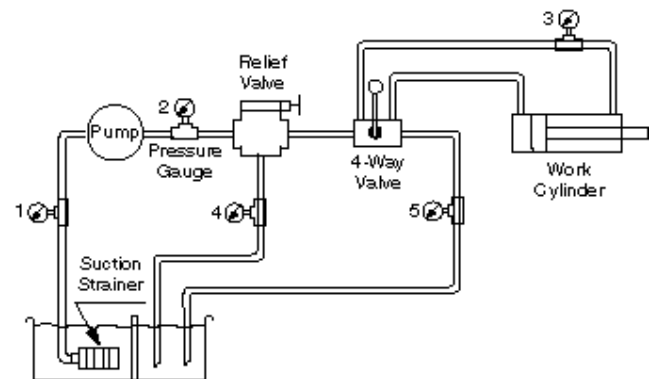


- Which one of the following valves uses a check to isolate part of the circuit?**
  - brake.
  - unloading.
  - counterbalance.
  - pressure relief.
  - pressure reducing.

5. Which load holding valve is used to lock a cylinder in place so it will hold position without drift?
- brake.
  - sequence.
  - unloading.
  - pilot check.
  - counterbalance.
6. A limit switch is used to:
- start the control circuit.
  - close the relay contacts.
  - signal the end of an event.
  - move the solenoid armature.
  - indicate when the circuit is energized.

7. Which pressure gauge in the figure shown could read the highest pressure?

- 1
- 2
- 3
- 4
- 5



8. The most common hydraulic fluid is:
- mineral oil.
  - synthetic fluid.
  - water.
9. The main reason for the hydraulic tank is to:
- hold enough fluid for the circuit.
  - deacerate the returned fluid.
  - cool the fluid.

10. What five characteristics does the valve below have?

- Normally open, 4-way, 2 position, detent, hydraulically actuated
- Normally open, two-way, three position, spring return, solenoid actuated
- Normally closed, two position, two-way, spring return, solenoid actuated
- Normally open, two position, two-way, spring return, hydraulically actuated



**Question (2): [15 Marks]**

1. Explain the purpose of the pressure reducing valve in the circuit shown in Figure (Q2.1).
2. After assembly, the hydraulic circuit shown in Figure (Q2.2) extends and retracts, but slower than at rated velocity. Which check valve (*A or B or C or D or E*) could be installed backward (reversed) and explain your choice?

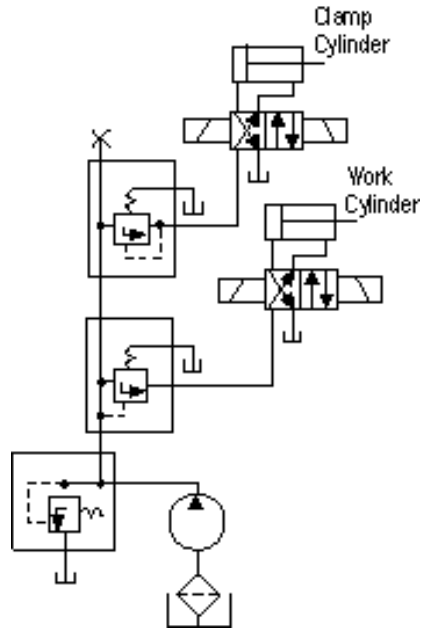


Fig. (Q2.1)

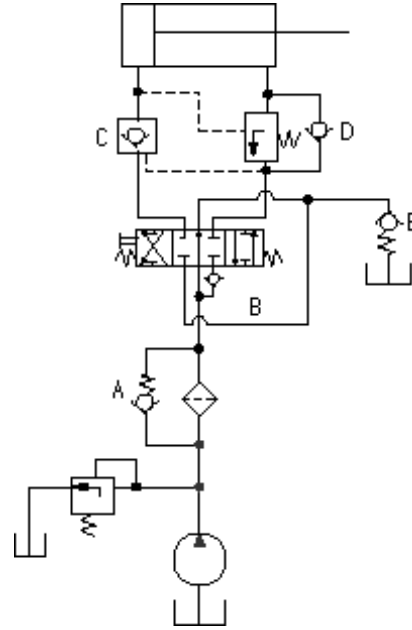


Fig. (Q2.2)

**Question (3): [20 Marks]**

1. How would you modify the system shown in Figure (Q3.1) if you wanted to avoid uncontrolled fall of the platen attached to the cylinder rod when the directional valve directs flow to the cap end of the cylinder? (*Don't redraw the circuit just modify the system in this paper*)
2. How would you modify the system shown in Figure (Q3.2) if you wanted the pump apply a low pressure to operate the unloading valve? (*Don't redraw the circuit just modify the system in this paper*)

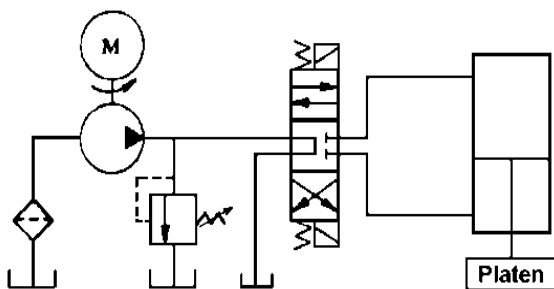


Fig. (Q3.1)

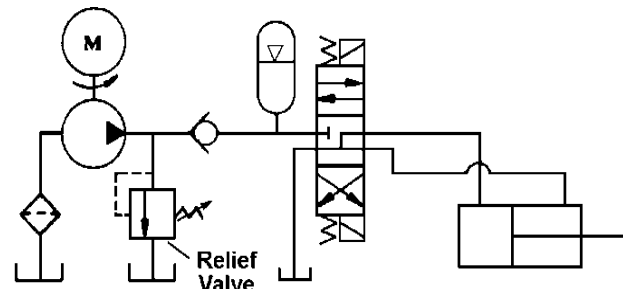


Fig. (Q3.2)

3. List the important factors to be considered when selecting a reservoir. What are the functions of the baffle plate?

**Question (4): [25 Marks]**

1. For the circuit shown in the Figure (Q4.1), determine the pump size (Q, H and shaft power) for the operation of the shown clamping circuit, knowing that:

- Clamping thrust 100 kN.
- Hydraulic cylinder has piston and rod sizes of 100 and 70 mm, respectively.
- Intensifier has diameters of ratio 5 : 1.
- Speed of forward stroke until start of clamping action is 3 m/min, and cylinder load during this stroke 5 kN.
- Pump efficiency 75%.

Assume no leakage occurs in the intensifier system, pipe work and connections and allow for 0.3 bar pressure drop in the 4/3 directional control valve and associated piping.

2. For the circuit shown in the Figure (Q4.2), identify the numbered components.

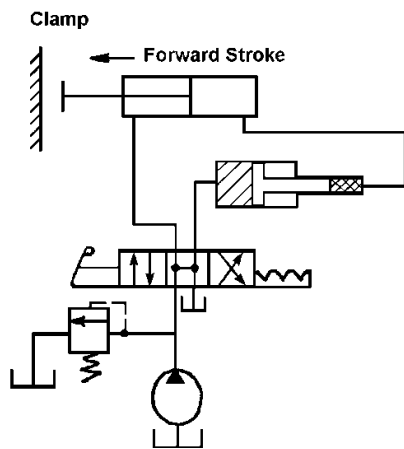


Fig. (Q4.1)

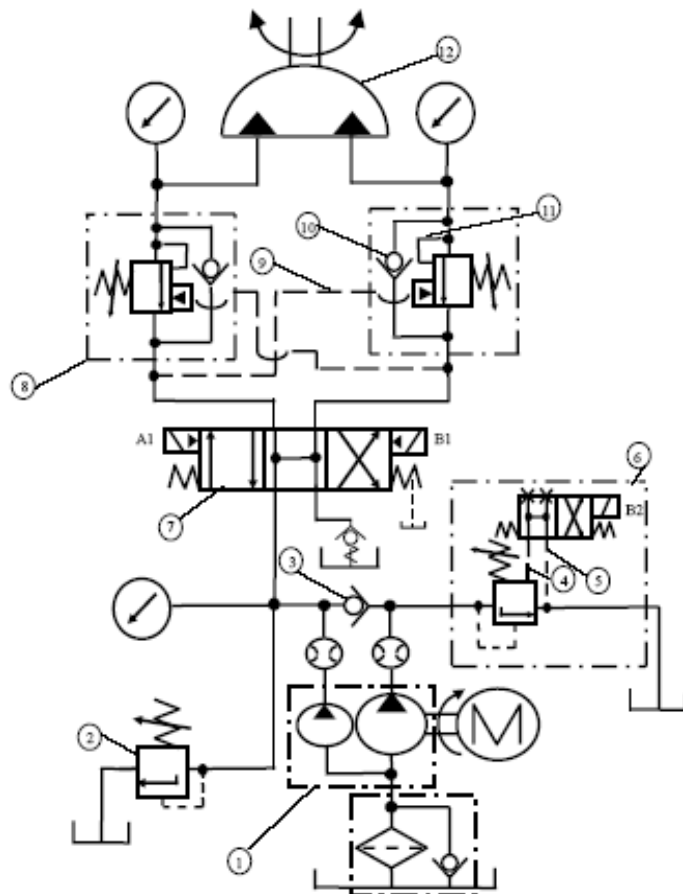


Fig. (Q4.2)

*Good Luck*