


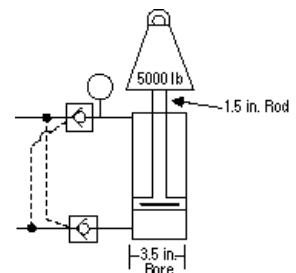
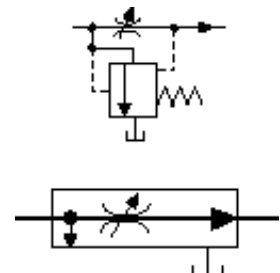
Tanta University	 Hydraulic and pneumatic circuits	4 <sup>th</sup> Year Mech. Power
Faculty of Engineering		Midterm Exam – April, 2015
Mech. Power Engineering Dept.		Full Marks:80, Time: 90 Min.
• Assume any missing data.		

**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.



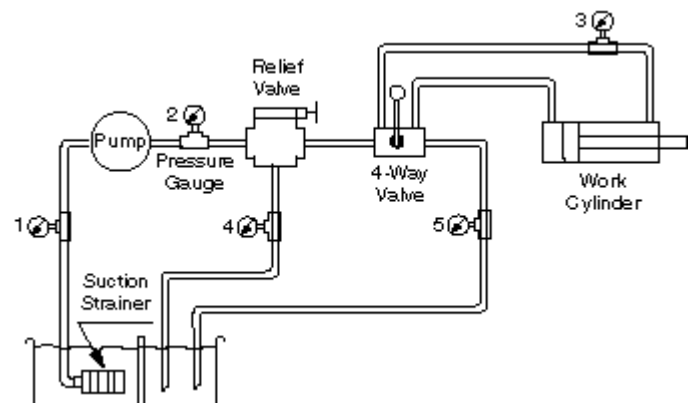
5. Which load holding valve is used to lock a cylinder in place so it will hold position without drift?
- brake.
  - sequence.
  - unloading.
  - pilot check.
  - counterbalance.

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:

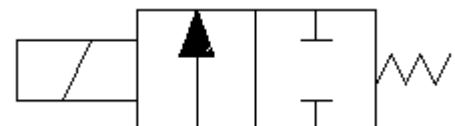
- mineral oil.
- synthetic fluid.
- water.

9. The main reason for the hydraulic tank is to:

- hold enough fluid for the circuit.
- deerate 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. Pressure compensated needle valve in the cylinder rod end line is shown in Figure (Q2.2)
  - a) Is this a meter in [    ], Meter out [    ], or Bleed-off circuit? [    ].
  - b) Will this cylinder be the same speed both directions?
  - c) If not, which way will it be fastest?

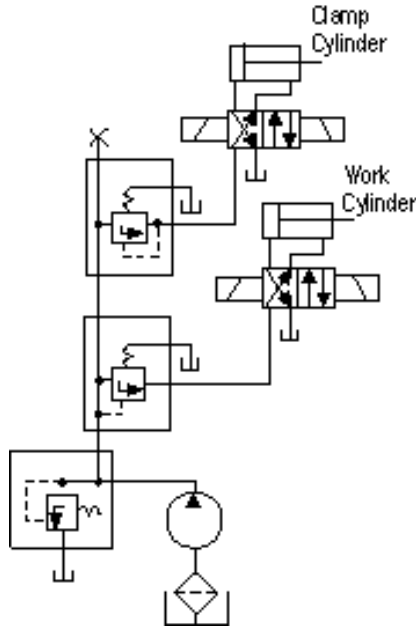


Fig. (Q2.1)

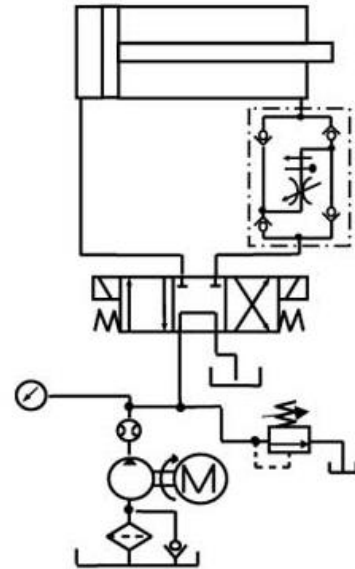


Fig. (Q2.2)

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

1. How would you modify the system shown in Figure (Q3.1) if you wanted the clamp cylinder B apply a lesser force than clamp A shaft? (*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 platen move through the material during the pressing process, the weight of the platen does not add to the total pressing force? (*Don't redraw the circuit just modify the system in this paper*)

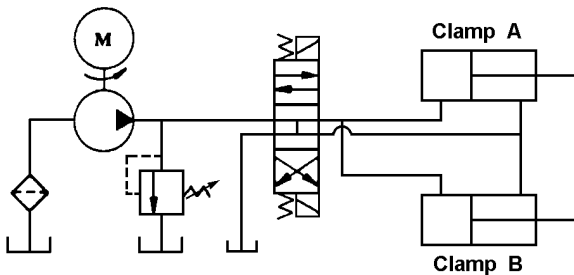


Fig. (Q3.1)

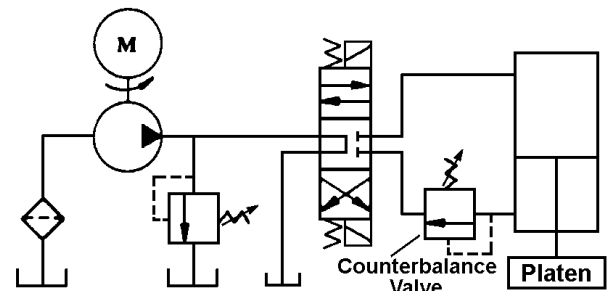


Fig. (Q3.2)

3. Operationally, what is the difference between a pressure relief valve and a pressure reducing valve? Draw the construction and symbol of each valve.

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

1. For the shown hydraulic circuit and from the information given, calculate the following parameters:
  - (a) Extending speed,
  - (b) Retracting speed,
  - (c) Pressure required to lift the load,
  - (d) Flow from the rod end (annulus area) of the cylinder while extending,
  - (e) Pump output power during load extension.
2. For the circuit shown in the Figure (Q4.2), identify the numbered components.

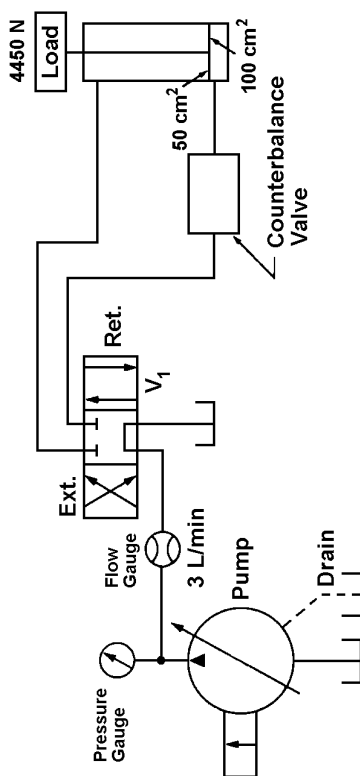


Fig. (Q4.1)

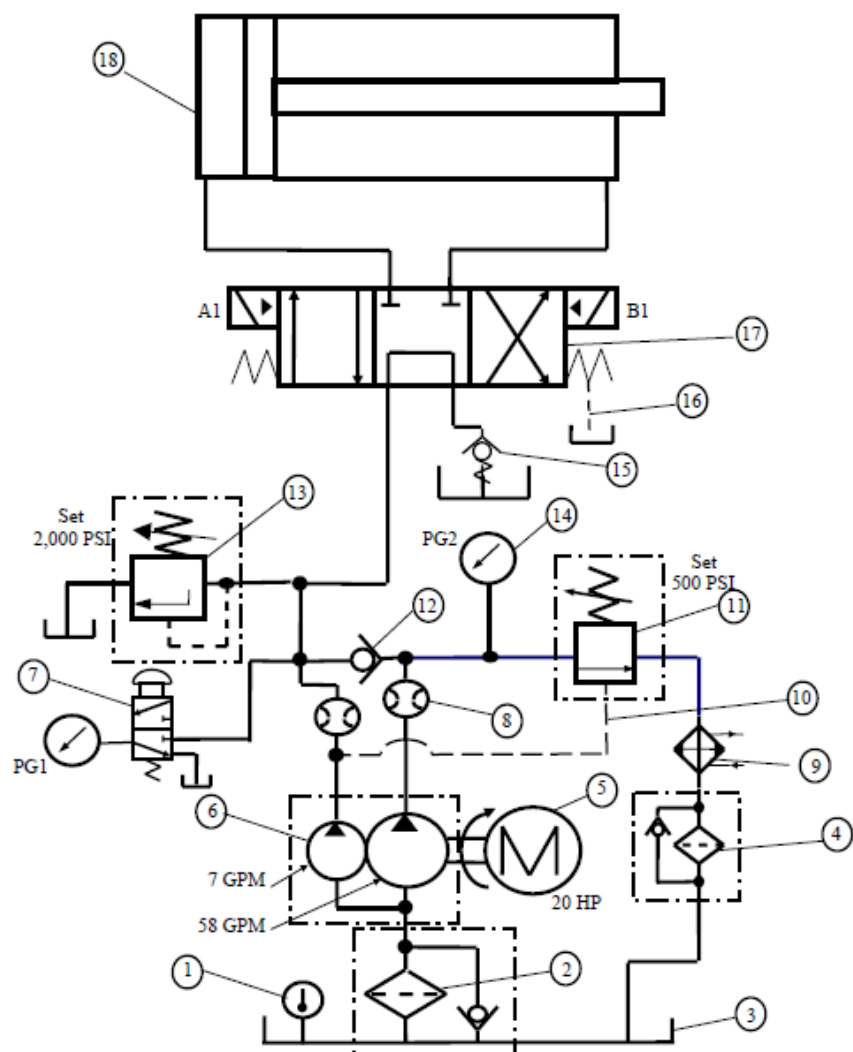


Fig. (Q4.2)

*Good Luck*