

Tanta University	 Hydraulic and pneumatic circuits	4 <sup>th</sup> Year Mech. Power
Faculty of Engineering		Final Exam – Sep., 2015
Mech. Power Engineering Dept.		Time: 3 hours.
<ul style="list-style-type: none"> <li>• Assume any missing or additional data.</li> <li>• Attempt all questions.</li> <li>• Support your answers with neat sketches whenever necessary.</li> </ul>		

الإمتحان من ورقتين كل ورقة لها وجهين

**Question (1)**

- What are the requirements of hydraulic fluids?
- Explain the principals of operation and the possible applications of the hydraulic accumulators.
- For the hydraulic circuit shown in **Figure (Q1.c)** and from the information given, calculate the following parameters:
  - Extending speed,
  - Retracting speed,
  - Pressure required to lift the load,
  - Flow from the rod end (annulus area) of the cylinder while extending,
  - Pump output power during load extension.

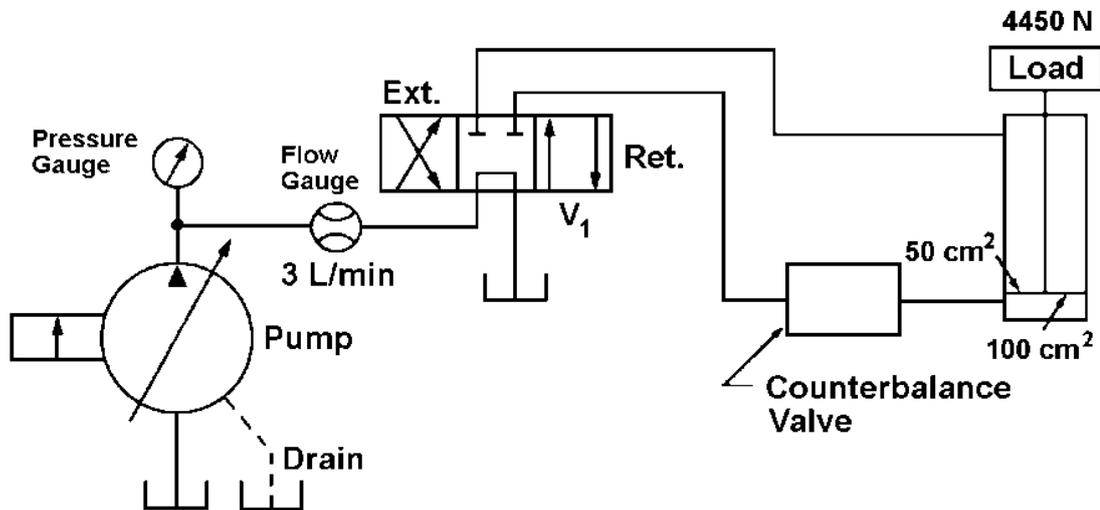


Fig. (Q1.c)

**Question (2)**

- Operationally, what is the difference between a pressure relief valve and a pressure reducing valve? Draw the construction and symbol of each valve.
- What is meant by a hydrostatic drive?
- Explain the function and principal of operation of cushion with a neat sketch.



- c. A special machine is used to emboss graphic symbols on metal foil. The foil is fed through the embossing machine. The advanced motion of the stamp must be capable of being varied in accordance with the feed speed as shown in the **Figure (Q3.c)**. The return motion must always be executed as a rapid traverse. A One way flow control valve is used to control the speed of the stamp, while a pressure relief valve is used to prevent the weight of the stamp from pulling the piston rod out of the cylinder. A 4/2 way valve is used to switch between advance and return motion. Draw the hydraulic circuit diagram by choosing the correct components according to the machine function and above explanation.

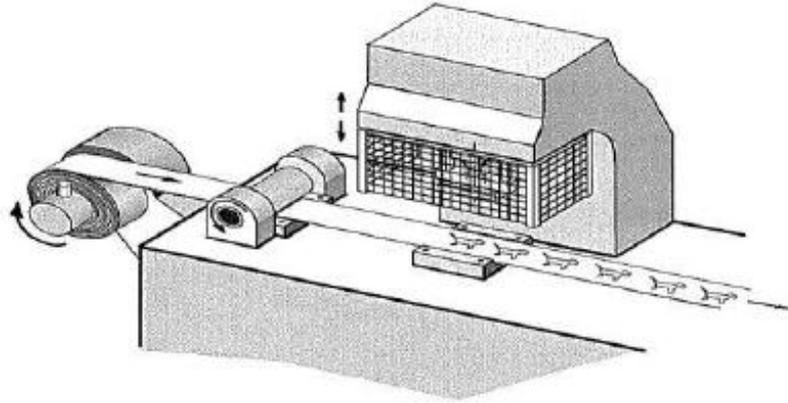


Fig. (Q3.c)

**Question (4)**

- a. In an application that requires a capacity flow of 100 L/min at 180 bar. If a partial load required a pressure of only 95 bar, and a metered flow rate of 40 L/min. Determine the **total** lost energy if:
1. The system as shown in **Figure (Q4.a)** under the same condition is used.
  2. A variable displacement pump under the same condition is used for the system in **Figure (Q4.a)**.
  3. A load-sensing system that uses a variable displacement pump has the destroking mechanism set at 15 bar under the same condition is used.
- Using (Q-P) diagram, show a comparison among three systems based on the used, lost and unused energies.
  - Explain the load-sensing system principle of operation with neat sketch.

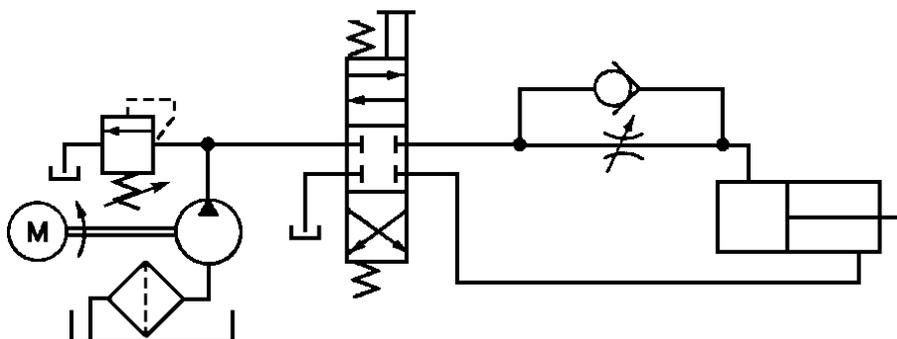


Fig. (Q4.a)

