10

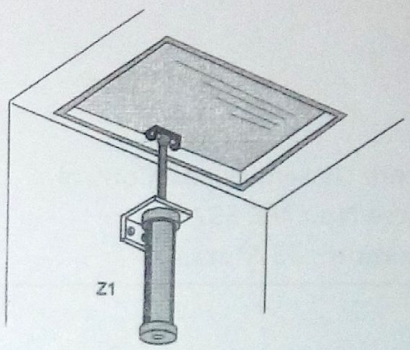
Problem-1 (5pts) , 2-Button, Spring return, Locked, Speed control

Consider designing a Hydraulic/Pneumatic circuit for opening and closing ventilation, as depicted in the figure. Push button S1 and S2 are to be used to open and close the ventilation, respectively. As soon as any button is released the cylinder piston should remain in its current position (mid positions are attained by briefly touching any one of the push buttons). Also, when there is a power failure the opening should remain in its position. The extension and retraction speeds should be infinitely adjustable.

Double acting

Spring return

Speed control. Locking



Double acting cylinder (open - close).

2- check valve with pilot line for locking

Valve for speed control.

4-way, 3-position D.C.V. with push buttons - with spring return

damper.

A -> for opening

B -> for closing

Pressure relive Valve.

filter

positive displasment Pump.

tank.

Hosam SHkokany 0137229.. (27)

Problem-2 (10pts) component 06 :- 3-way, 2 position Directional control valve. Push button signal with spring return.

Consider the Pneumatic application depicted in the figure.

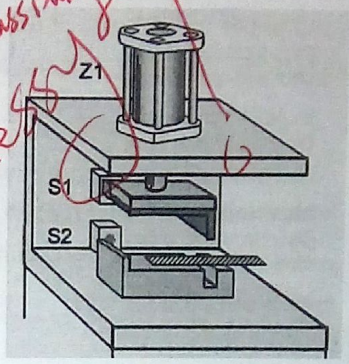
a. List the names of the following components in details:

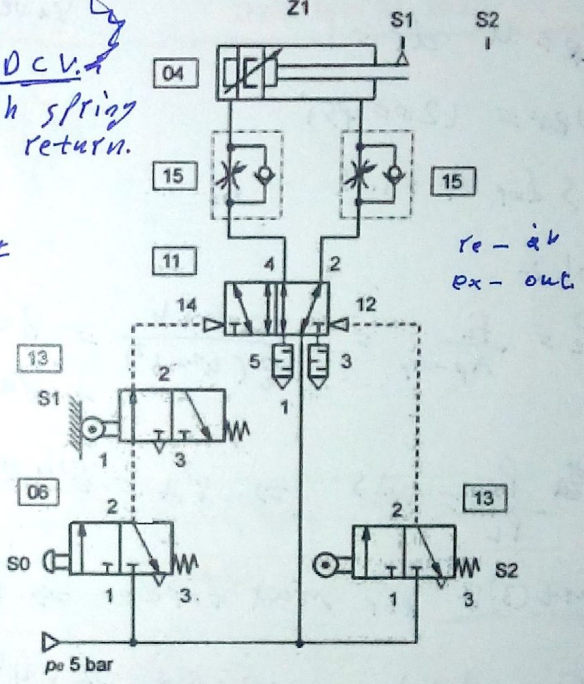
04 – double acting cylinder with dumper inside (variable cussioning) Very Mess

15 ⇒ flow controler valve

11 (5-way, 2 position Directional control valve pilot operated with pnumatic pilot signal Very

13 ⇒ 3-way, 2 position DCV. mechanical signal with spring return.





b. Describe why component number 13 is used

⇒ to give signal to component number 11 to change the position. by the pilot line when to do that.

c. Describe briefly in points the functionality of the circuit Starting from component number 06.

A) Default case :- air go through Line 1 to component 11 to Line 2 to the cylinder through the flow controller valve and the piston will retract, the out flow will go to out side through DCV (11) by exhust

B) when push button (S0) :- component (06) give signal to (13) and (13) give signal to DCV(11) and switch the position ⇒ the flow will go through Lines :- 1 – 4 and the piston will extend and exhust go through (3).

C) when push button (S2) :- the DCV (11) will take asignel and back to default case.

Problem-3 (5pts)

$P_w = F_L = 10$ klb. $d_cy = 4$ in, $d_r = 1$ in.

Consider a hydraulically operated platen press, which has its piston weighs 10,0001b. The diameter of the cylinder is 4 inches and of the rod is 1 inch. If the pressure relief valve B is set for 1200psi and the counter balance valve A is set such that the factor of safety against the platen falling will be 1.15. Determine the following:

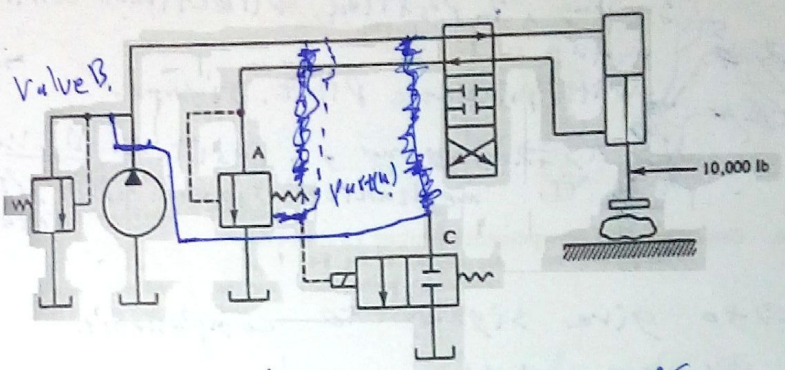
1. Setting of counter valve A.
2. The pump outlet pressure required to power the platen down when it does not encounter the workpiece.
3. Maximum working force the platen can provide to the workpiece.
4. Connect valve C to the circuit in order to increase the working force in part-c by 11,5001b
5. Setting of valve C.

$F_L = 10$ klb.

$d_p = 4$ $d_r = 1$

$P_{PRV} = 1200$ psi

F.S for A = 1.15



sol :-

$$P_L = \frac{F_L}{A_p - A_r} = \frac{10 \text{ klb}}{\frac{\pi}{4}(4^2 - 1^2)} = 848.83 \text{ lbf/in}^2$$

$= 848.83$ psi.

$$\frac{P_A}{P_L} = 1.15 \Rightarrow P_A = 848.83 \times 1.15 = \boxed{975.64 \text{ psi} = P_A}$$ part(1)

Part(3):- for max force $\Rightarrow P = P_{max} = P_{PRV} = 1200$ psi.

$$F = P * A_p = 1200 * \frac{\pi}{4} \times 4^2 = \boxed{15.08 \text{ klbf.} = \text{max force}}$$ Part (3)

Part(2):

$\boxed{P_{pump} = P_A = 975.64 \text{ psi}}$

Part(4):- we put value C insted of value B. with setting pressure = 2115.12 psi to give us incresing in the max force by 11.5 klbf.

Part 5):-

$F = 15.08 + 11.5 = 26.58$ klbf.

$$\boxed{P = \frac{26.58 \text{ klb}}{\frac{\pi}{4} \times 4^2} = 2115.12 \text{ psi}}$$ pressure for valve C