College of Engineering & Technology

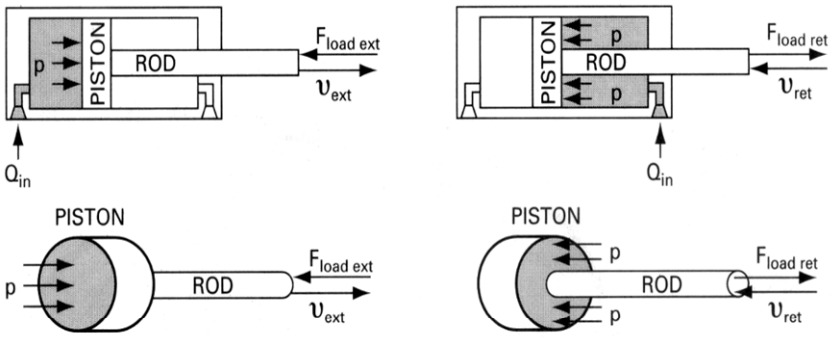
Department: Mechanical Engineering Marks: 20
Lecturer: Dr. Rola Afify Time: 1.00 - 2.10
Course Code: ME464 Date: 30/4/2013

Name: **Model Answer**

Answer the following questions:

Question one (5 marks)

Prove that: $F_{ext} > F_{ret}$ & $V_{ext} < V_{ret}$



$$\upsilon_{ext}(\mathrm{m/s}) = \frac{Q_{in}(\mathrm{m^3/s})}{A_p(\mathrm{m^2})}$$

$$\upsilon_{ret}(\mathrm{m/s}) = \frac{Q_{in}(\mathrm{m^3/s})}{(A_p - A_r)\mathrm{m^2}}$$

Then $V_{ext} < V_{ret}$

$$F_{ext}(\mathrm{N}) = p\,(\mathrm{Pa}) \times A_p(\mathrm{m^2})$$

$$F_{ret}(\mathrm{N}) = p\,(\mathrm{Pa}) \times (A_p - A_r)\mathrm{m^2}$$

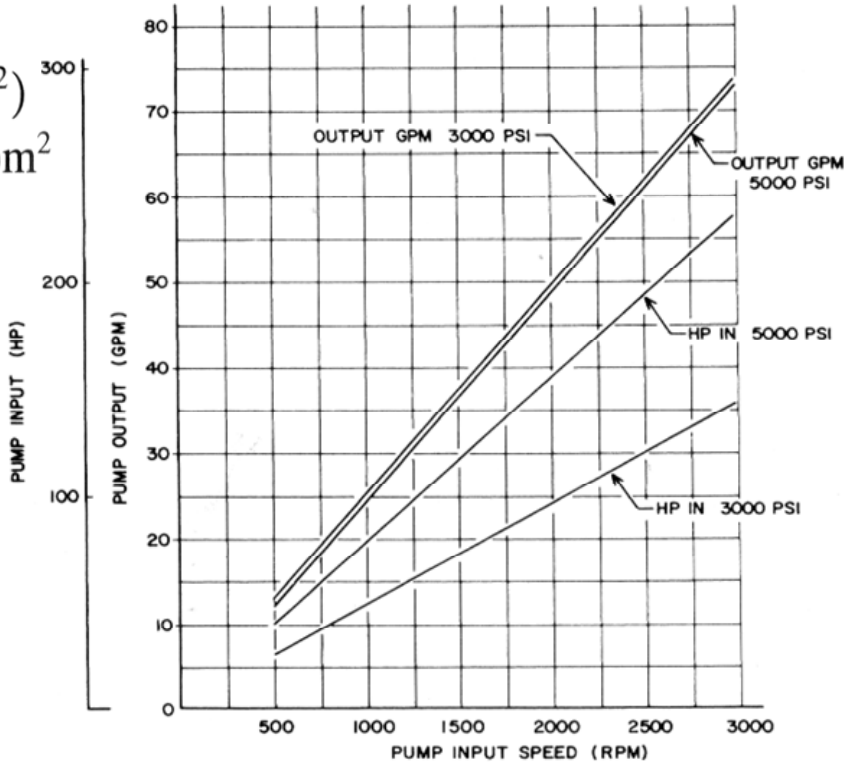
Then $F_{ext} > F_{ret}$

Question two (10 marks)

The shown graph gives the pump input horsepower (hp), and pump output flow (gpm) as a function of Pump speed, for pressure level of 3000 psi. The volumetric displacement of the pump is 6 in^3/rev.

i- Calculate the volumetric efficiency at the pressure level, at input power of 100 hp.

ii- Calculate the mechanical efficiency at the pressure level, at 2000 rpm.



i-volumetric Efficiency= Q_A/Q_{th}

$Q_{th} = V_D \times RPM$ & $V_D = 6\ in^3/rev$

From the graph at 100 hp:

RPM =2050

Q_A = 51 gpm= $51 \times 3.78 \times 10^{-3}/60 = 0.0032\ m^3/s$

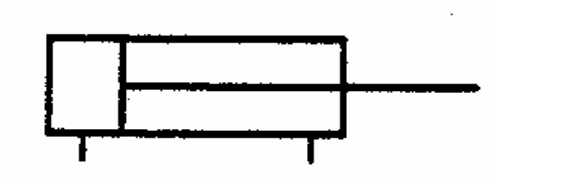
$Q_{th} = 6 \times 2050 \times (2.54 \times 10^{-2})^3/60 = 0.0033\ m^3/s$

volumetric Efficiency =0.0032/0.0033=0.9696

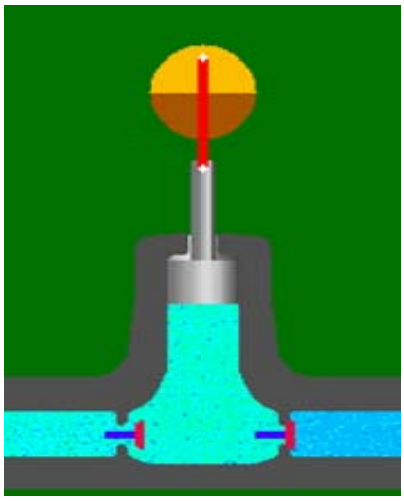
ii- From the graph at 2000 RPM:
hp = 98 hp
Q_{th} =6x2000x$(2.54x10^{-2})^3$/60= 0.00327 m^3/s
Mechanical Efficiency =Px Q_{th} / hp =3000x0.0689x10^5x0.00327/98x746
= 0.9245

Question three (5 marks)

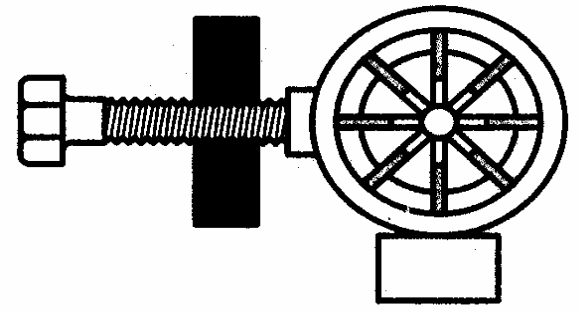
Write down the words that represent each of the following:



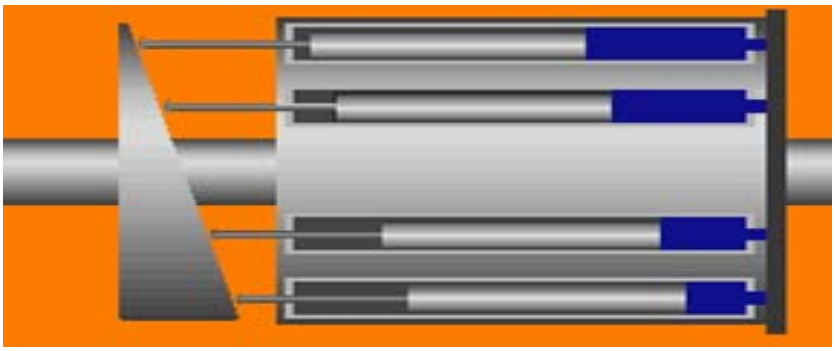
Single-Acting Hydraulic Cylinder



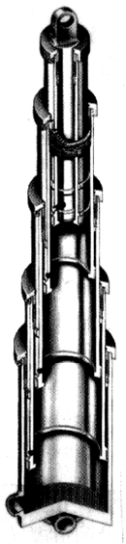
Piston Pump



Variable Displacement Vane Pump



Swash Plate Design Axial Piston Pump



Telescopic cylinder

Good Luck 1/1