	15

College of Engineering & Technology

Department: Mechanical Engineering   Marks: 15
Lecturer: Dr. Rola Afify   Time: 9:30- 10:10
Course Code: ME464   Date: 24/3/2016

Name: **Model Answer**   R. N.:

Answer the following questions:

Question one (7 marks)

A) What are the properties of Hydraulic Fluid (mention 5)?

1 – Good lubricity.	8 – Low density.
2 – I deal viscosity.	9 – Foam resistance.
3 – Chemical and environmental stability.	10 – No toxicity.
4 – Compatibility with system materials.	11 – Low volatility.
5 – High degree of incompressible.	12 – Inexpensive.
6 – Fire resistance.	13 – Ready availability.
7 – Good heat transfer capable.	

B) Draw the Block Diagram of Hydraulic System Showing Major Components showing how
   Energy is transferred throughout a Hydraulic System.
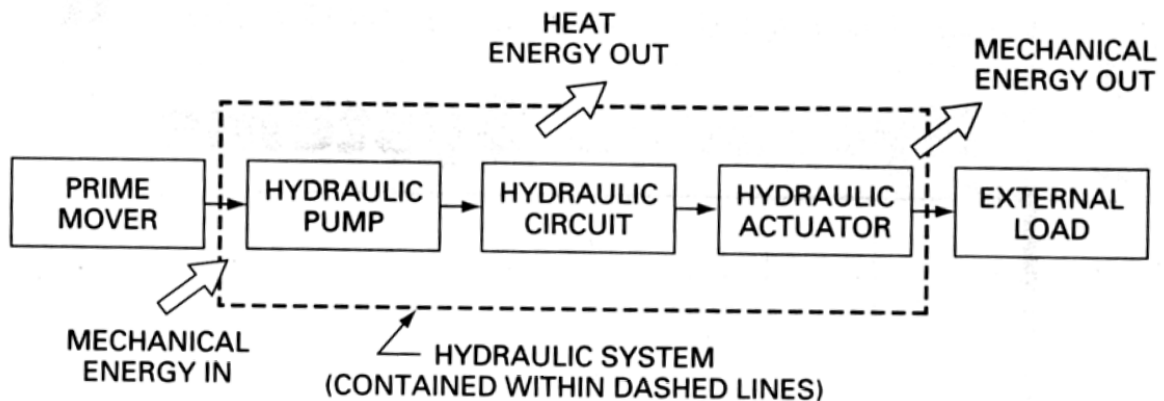
Question two (8 marks)

A) Prove that Energy can be neither created nor destroyed.
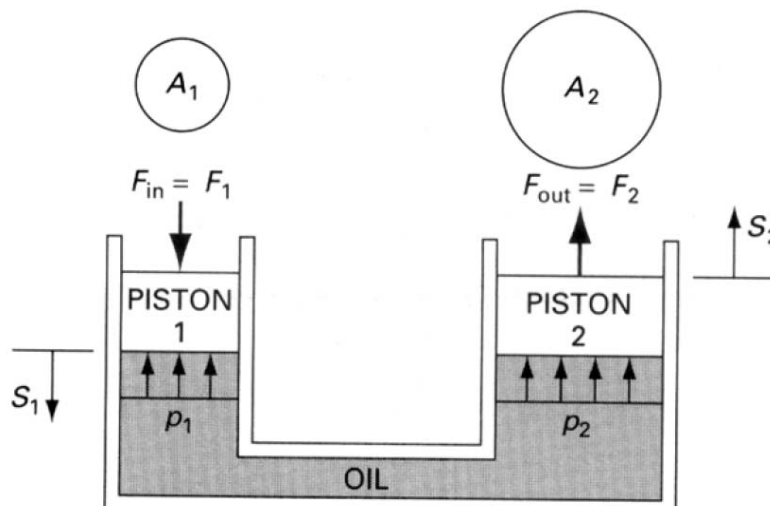
Operation of Simple Hydraulic Jack

By Pascal's Law, $p_1 = p_2$.

$$(F_1/A_1) = (F_2/A_2)$$
$$(F_2/F_1) = (A_2/A_1) \qquad (1)$$

A Force Multiplication occurs from the Input to the Output of the Jack if the Output Piston Area is greater than the Input Piston Area.

The cylindrical volume of oil displaced by the input piston equals the cylindrical volume displaced by the output piston:

$$V_1 = V_2$$
$$A_1 S_1 = A_2 S_2$$

S_1 = Downward movement of piston 1,
S_2 = Upward movement of piston 2.

$$(S_1/S_2) = (A_2/A_1) \qquad (2)$$

Combining Eq. (1) and (2) yields the corresponding relationship

$$(F_1/F_2) = (S_1/S_2)$$
$$F_1 S_1 = F_2 S_2 \qquad (3)$$

The Energy Input to the Hydraulic Jack equals the Energy Output from the Jack.

B) Draw conversion of Power from Input Electrical to Mechanical to Hydraulic to Output Mechanical in a Hydraulic System.

Dr. Rola Afify