Mechanical Eng. Dept. **ME 351**	**Taibah University** **College of Engineering**	**Machine Design I** **October 2020** **1st Quiz** **Time allowed: 30 Min.**

The given drawing shows the basic features of a hydraulic crane with a lifting capacity of **W= 0.5 ton**. The crane is composed of a hydraulic cylinder **(1)** manufactured from AISI 1030 steel, a high carbon steel hook **(2)** by which the objects are carried, steel boom **(3)** and a frame fabricated from carbon steel **(4)**.

You are required to:-

1- By assuming the hydraulic cylinder used for operating this crane has a bore diameter of 100 mm, find the following:

a- The oil pressure required to operate this cylinder

b- Cylinder wall thickness, its material has S_y **= 350 MPa** and safety factor**= 5**

c- Piston rod diameter, its material has S_y **= 280 MPa** and safety factor**= 4**

2- Design the boom **(3)**, assume its cross section is hollow square box with **100** sides and its material is **St. 50** and safety factor **= 5 ,** (find the section thickness of boom)