اسم الطالب	
الرقم الأكاديمي	
اسم المقرر	هيدروليكا (1)
المستوى	الأول
عنوان البحث المرجعي	مبادئ ميكانيكا الموائع والهيدروليكا

رقم السؤال	الدرجة	التوقيع
السؤال الأول		
السؤال الثاني		
السؤال الثالث		
السؤال الرابع		
السؤال الخامس		
المجموع		

توقيع لجنة الامتحان

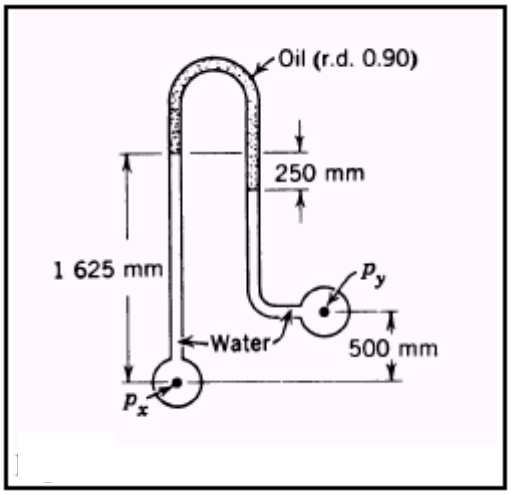
Answer the Following Questions (Total 100degrees):

***Question no. 1** (20 points).*

Two large plane surfaces are 20 mm apart and the space between them is filled with a liquid of viscosity μ =8*10^{-3} kg/m.s. A thin plate of area 0.2 m^2 is introduced between the surfaces, a distance of 5 mm from one them. Assuming linear velocity profiles between the plate and the upper and lower surfaces, what force is required to pull the plate at a constant speed of 0.3 m/s?

***Question no. 2** (20 points).*

Two pipes carrying water under pressure, are connected by inverted U-tube manometer as shown in figure, calculate the pressure difference $p_x - p_y$. What will be the manometer reading, if the pressure difference is increased by 2 K.pa.



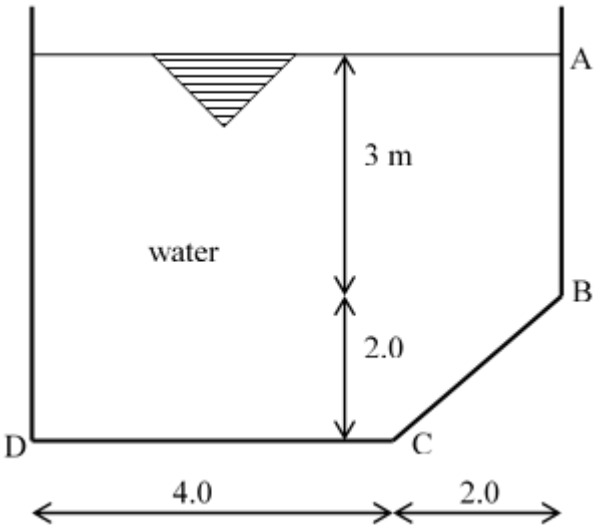
***Question no. 3** (20 points).*

For the given tank, find the following:

i) The gauge pressure at points A, B, C and D.

ii) Draw the hydrostatic pressure distribution on the part wall ABCD.

iii) Find the forces acting on walls AB, BC and CD (magnitude and position).



Question no. 4 *(**20** points).*

A horizontal venturi meter with a discharge coefficient of 0.98 is being used to measure the flow rate of a liquid of density 1030 kg/m^3. The pipe diameter at entry to the venturi is 75 mm and the venturi throat has an area of 1000 mm^2. If the flow rate is 0.011 m^3/s determine the height difference recorded on a U-tube manometer connecting the throat to the upstream pipe. Take the relative density of the mercury to be 13.6.

***Question no. 5** (20 points).*

A 300 mm diameter pipeline, 2000 m long and of friction factor f = 0.012 delivers water between reservoirs the minimum difference in water level between which is 50 m.

a. **Taking only friction, entry and exit losses into account, determine the steady discharge between the reservoirs.**
b. **If the discharge is to be increased by 20% without increase in gross head, determine the length of 500 mm diameter pipe of roughness e= 0.015 mm to be fitted in parallel to the original pipe (Consider only friction losses for this pipe).**
c. **Draw the total energy line and hydraulic grade line for the two cases of discharge.**