FAHAD BIN SULTAN UNIVERSITY
College of Engineering
Department of Mechanical Engineering

The Final exam: Fluid Mechanics (MECH 341)

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الفصل الدراسي : الأول **العام الدراسي : 2021 / 2020**

عدد الأسئلة : 4 **زمن الامتحان : ساعتان (120 دقيقة)**

رقم السؤال	درجة السؤال	درجة الطالب	اسم المصحح	توقيع المصحح
الاول	10			
الثاني	8			
الثالث	10			
الرابع	12			
المجموع	40			

تعليمات الاختبار:

I. الإجابة على جميع الأسئلة

II. كتابة جميع الخطوات المطلوبة على ورقة الإجابة

Question no. 1 (10 points).

1- List the assumptions required for applying Bernoulli equation.
I-

II-

III-

IV-

2- In Newtonian fluids the shear force is not proportional to the rate of deformation.
(a) False (b) True

3- Reynolds number is given by
(a) ρvμ/D (b) μDρ/v (c) ρv/μD (d) ρvD/μ

4- Dimensional analysis can be used to reduce the number of variables for investigation of a phenomenon.
(b) False (b) True

5- Grouping of variables into dimensionless parameters reduces number of experiments.
(a) False (b) True

6- The gravity is 10.0 m/s^2. The density of fluid was 2000 kg/m^3. The pressure exerted by a column of 1 m of the fluid will be
(a) 20000 N/m^2 (b) 10,000 N/m^2 (c) 2000 N/m^2 (d) 200 N/m^2

7- In a static fluid, with y as the vertical direction, the pressure variation is given by
(a) $dp/dy = \rho$ (b) $dp/dy = -\rho$ (c) $dp/dy = -\gamma$ (d) $dp/dy = \gamma$

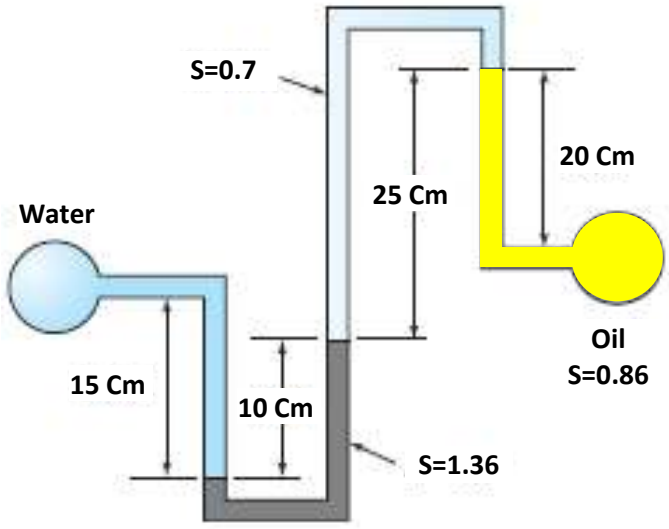
8- The location of the center of pressure over a vertical surface immersed (مغمور) in a liquid is
(a) always above the centroid (b) will be at the centroid
(c) will be below the centroid (d) according the fluid density.

9- Compare the ship draft, h, (غاطس السفينة) in the river and in the sea $\boldsymbol{where\ \rho_{river} < \rho_{sea}}$
(a) $h_{river} < h_{sea}$ (b) $h_{river} > h_{sea}$ (c) $h_{river} = h_{sea}$. (d) No relation.

10- In a horizontal flow of incompressible real fluid along a constant pipe section under steady conditions, the total energy line along flow direction will
(a) slope upward (b) be horizontal line
(c) slope downward (d) be upward or downward depending on the fluid

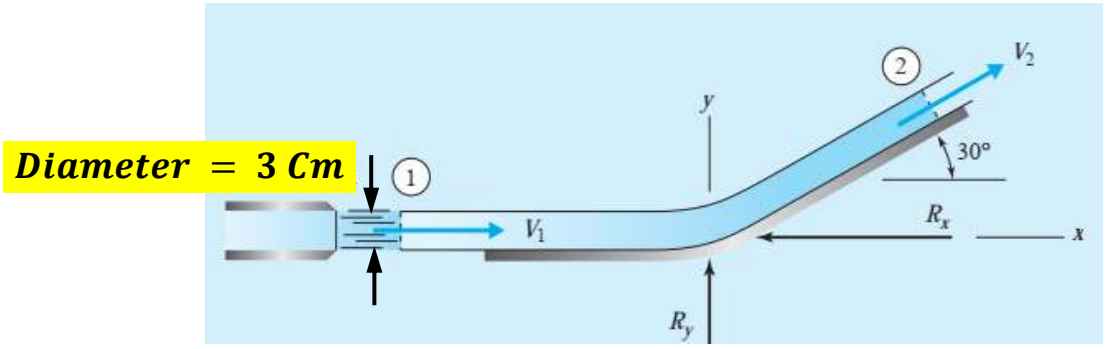
Question no. 2 (8 points).

Determine the pressure difference between the water pipe and the oil pipe shown in figure.



Question no. 3 (10 points).

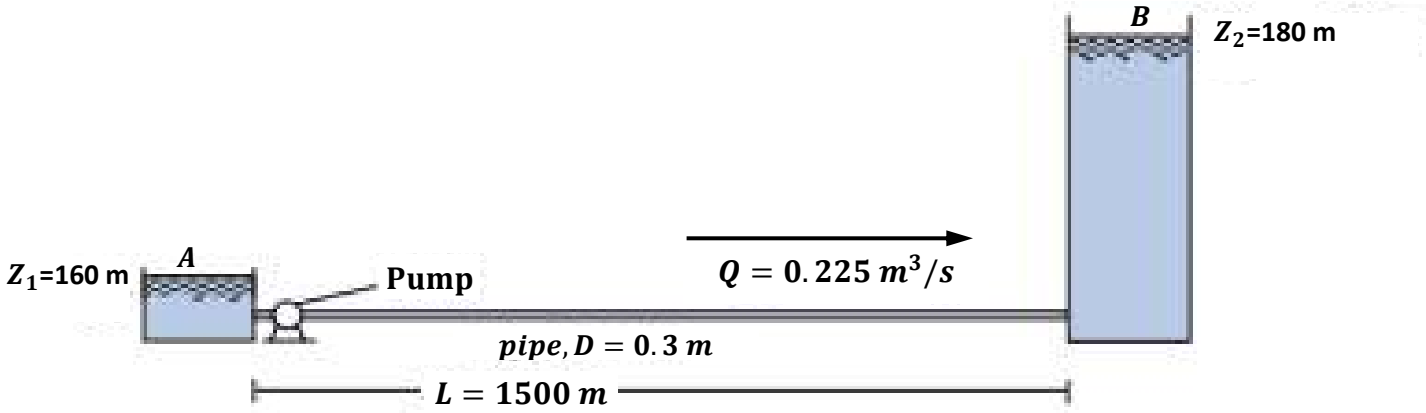
A deflector turns **a jet** of water through an angle of **30°** as shown in figure. What force components (R_x, R_y) are necessary to hold the deflector in place if **$\dot{m}$ = 30 kg/s**?



Question no. 4 (12 points).

A pump draws water (المضخة تسحب المياه) from a reservoir ***A***, where the water-surface elevation is **160 m**, and forces the water through a pipe **1500 m** long and **0.3 m** in diameter. This pipe then discharges the water into a reservoir ***B*,** with water-surface elevation of **180 m**. The flow rate is $\mathbf{0.225\ m^3/s}$, and the friction factor in the pipe is **0.01**. Neglect all minor losses, Determine:-

a- The head supplied by the pump, H_{pump}.
b- The power required to drive the pump if the pump efficiency is 85%.
c- Draw the HGL and TEL for the system.



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Best wishes Dr. Mohammed Eldoskoy *Mohammed Eldosoky*