UVA WELLASSA UNIVERSITY OF SRI LANKA
FACULTY OF ANIMAL SCIENCE & EXPORT AGRICULTURE

BSc in Export Agriculture
BSc in Palm & Latex Technology and Value Addition
BSc in Tea Technology and Value Addition

Second Year First Semester Examination – December/January/2016/2017

Principles of Agricultural Engineering (EAG 142- 2)
Section III – Essay Questions

Instructions

Answer all questions.

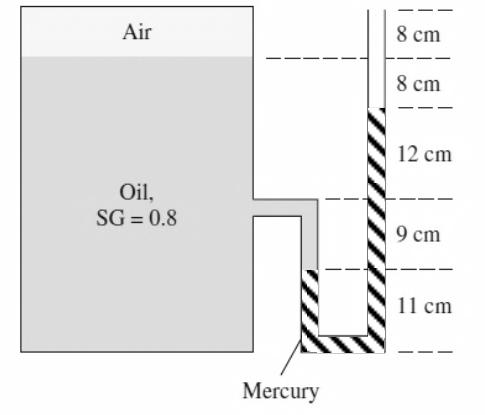
No. of questions	:	Two (02)
No. of pages	:	Three (03)
Time	:	One (01) Hour
Total marks allocated	:	50 %

01.

I.

a. Write the equation for absolute pressure and gauge pressure of a fluid column if the atmospheric pressure is "P_0", the height is "h", density of the fluid is "ρ" and gravitational acceleration is "g". (10 marks)

b. What will happen to the atmospheric pressure with increasing from earth surface when go up? Elaborate the answer. (10 marks)

c. 

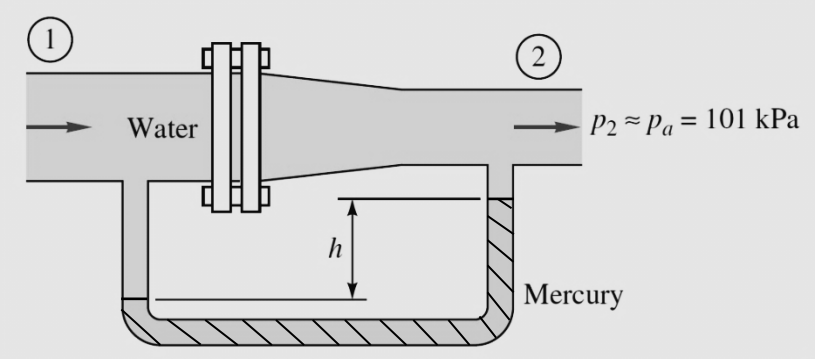
A container has an air gap and oil as shown in the figure. The specific gravity of the oil is 0.8 and mercury is 13.6. Find out the pressure of the air gap with respect to the given information in the diagram. (20 marks)

II.

a. State the Bernoulli's therom. (10 marks)

b. Write the Bernoulli's equation defining all the parameters. (10 marks)

c. A diagram of a Venturi tube is given below. The water flows through this tube and a manometer is attached to it. The pressure at point 2 (P_2) is 101 kPa, velocity of water at point 1 (V1) is $5ms^{-1}$, diameter of pipe at point 1 (d_1) is 8 cm and point 2 (d_2) is 5 cm. the manometer reading (h) is 58 cm. Answer the following questions based on that.



i. Find the velocity at point 2 (V_2). (15 marks)

ii. Find the pressure at point 1 (P_1). (15 marks)

iii. Draw the velocity changes of water along the pipe from 1 to point 2. (10 marks)

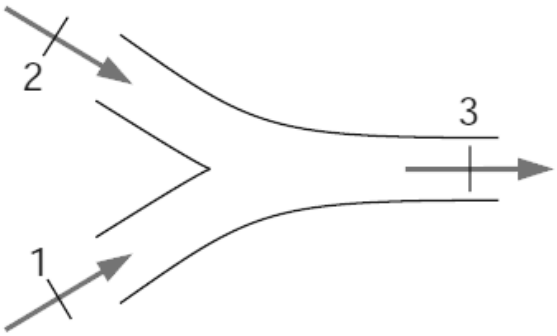
02.

I.

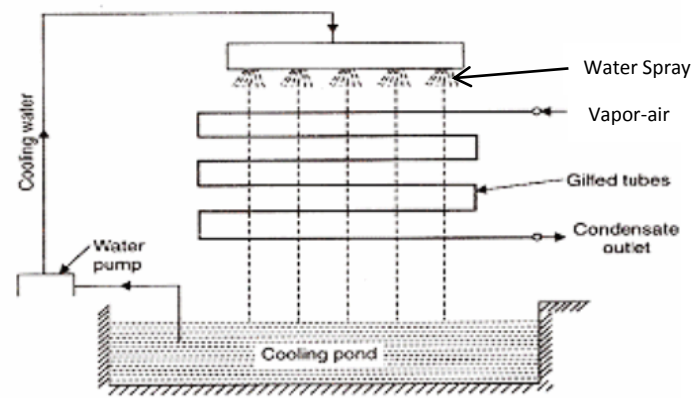
a. Explain the quasi equilibrium and non-quasi equilibrium process using a piston and a cylinder. (10 marks)

b. Draw the PV diagrams separately for Isothermal, Isobaric and Isometric processes. (10 marks)

c. Two air flows are combined to a single flow. One flow is 1 m^3/s at 20 °C and the other is 2 m^3/s at 200 °C, both at 100 kPa, as shown in the figure. They mix without any heat transfer to produce an exit flow at 100 kPa. Neglect kinetic energy changes and find the exit temperature and volume flow rate of exit flow. (20 marks)



II. A hot air-vapor mixture sends through a pipe to cool down by a water shower is shown in the diagram below.



The inlet air-vapor mixture temperature is 50 °C and Relative Humidity (RH) 30%. The volume flow rate of inlet air-vapor mixture is 10 m^3/s. The outlet air-vapor mixture temperature is 15 °C. The cooling shower water temperature is 10 °C and water spraying rate is 50m^3/s.

a. Find out the mass flow rate of the air-vapor mixture sending through the pipe.
b. Find out the moisture removal rate from air-vapor mixture.
c. Find out the latent heat change and sensible heat change of the air-vapor mixture.
d. Find out the heat removal rate form air-vapor mixture.
e. What is the RH of outlet air-vapor mixture?
f. Calculate the temperature of spray water after cooling down the air-vapor mixture.

(6 x 10 marks)