TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Pure & Applied Sciences
UNIVERSITY EXAMINATION FOR:
BSc.
Type unit code **: Fundamental of Fluid Mechanics**
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Pick Date **Sep 2018**

Instruction to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt question **ONE** and any other **TWO** questions.

Maximum marks for each part of a question are as shown.

Do not write on the question paper.

Question ONE

a) Define *Pressure* in fluids and give its dimensions (3 marks)

b) Differentiate between Newtonian's and Non-Newtonian's fluids (3 marks)

c) State Bernoulli's Equation and explain its component (5 marks)

d) Name three characteristic of Laminar Flow and three characteristic of Turbulent Flow.

(6 marks)

e) State law of

i) Conservation of Matter
ii) Conservation of Energy
iii) Conservation of Momentum (3 marks)

Question TWO

a) Derive the Newton's Law of Viscosity (6 marks)

b) What is an ideal fluid (2 marks)

c) Determine the dimension of the following

i) Force
ii) Pressure
iii) Density
iv) Dynamic viscosity (4 marks)

d) Define the following terms and give their equations
i) Specific weight
ii) Mass density
iii) Relative density
iv) Viscosity (8 marks)

Question THREE

a) State mathematically what is Pressure (2 marks)

b) State Pascal's Law (2 marks)

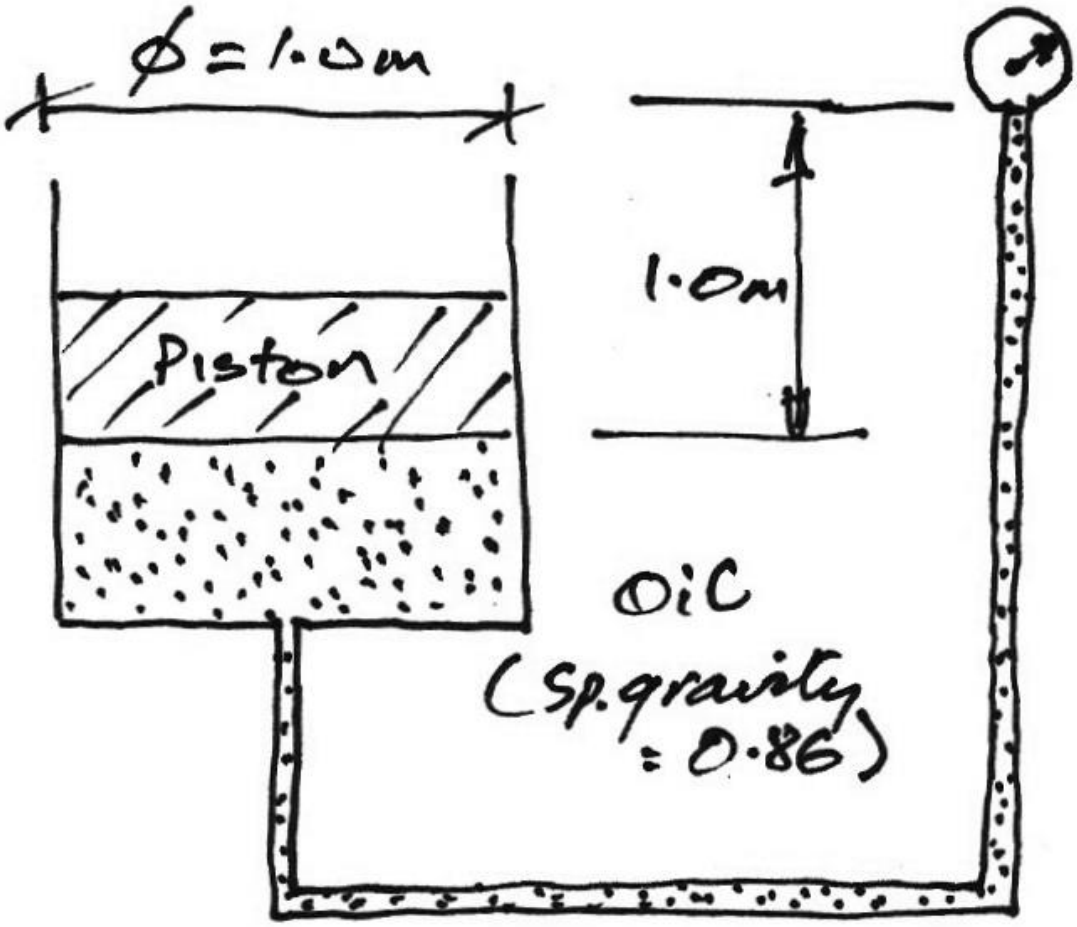
c) Prove that the pressure gauge at any depth from the surface of a fluid is given by

$$P = \rho g h$$ (4 marks)

d) What is a Piezometer (2 marks)

e) What is the pressure head, in meters of water exerted by the atmosphere (3 marks)

f) For the configuration shown, calculate the weight of the piston if the gauge pressure reading is 70 kPa. (3 marks)



g) Define the following characteristics of fluid flow

i) Steady Flow
ii) uniform Flow (4 marks)

Question FOUR

a) What is a streamtube (2 marks)

b) Derive the continuity equation (5 marks)

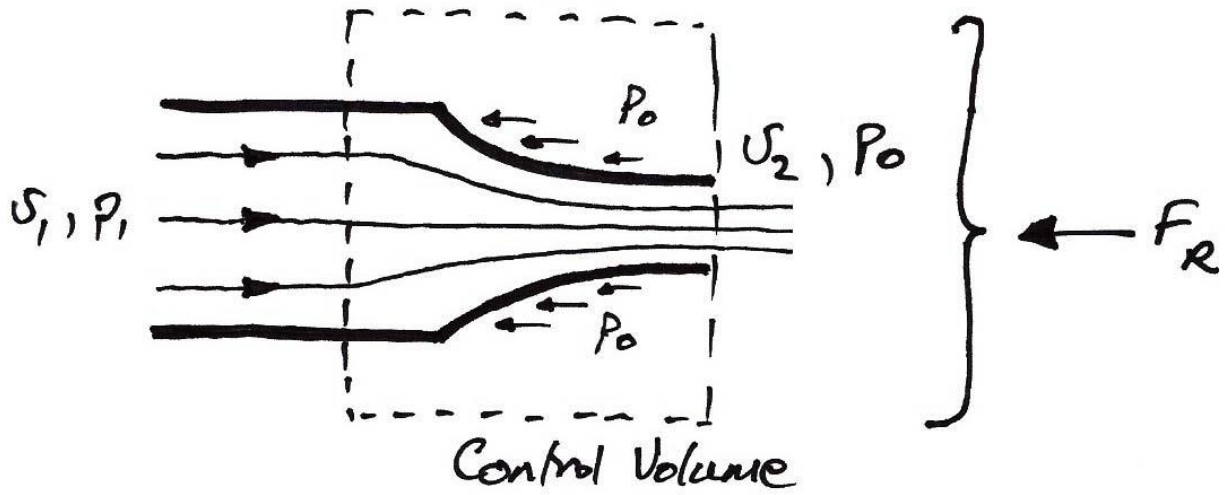
c) Name and describe the type of energy is in a fluid system (6 marks)

d) Evaluate Newton's Second Law; Momentum Equation (4 marks)

e) Name Flows according to Reynolds's Number (3 marks)

Question FIVE

a) A firehose discharges 5 l/s. The nozzle inlet and outlet diameters are 75 and 25 mm respectively. Calculate the force required to hold the hose in place.



(10 marks)

b) If we consider a garden hose of 15 mm diameter then what is the limiting average velocity for laminar flow? (2 marks)

c) What is critical velocity (2 marks)

d) Determine pipe Friction factor λ for Laminar Flow (6 marks)