

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya.**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** [**info@must.ac.ke**](mailto:info@must.ac.ke)

**University Examinations 2015/2016**

SECOND YEAR SECOND SEMESTER EXAMINATION

FOR DIPLOMA IN

CIVIL ENGINEERING

**EMC 2251: FLUID MECHANICS II**

**DATE: APRIL 2016 TIME: 1 ½ HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Explain negative slip in a reciprocating pump and state under what circumstances it occurs. (3 marks)
2. The ratio between length and diameter of a pipe is 600, determine the heat lost due to friction using Chezy’s formula. Assume the velocity of water as 5m/s and Chezy’s constant as 100. (5 marks)
3. Oil having coefficient of dynamic viscosity of 0.083 kg/m-s flows between two very large parallel plates 24mm apart, if the mean velocity of 0.7 is 0.15m/s, what is the shearing stress at 6mm from the lower plate? (6 marks)
4. A single acting reciprocating pump was a plonger diameter 15cm and stroke 30cm, it discharges 200 litres of water per minute at 40 rpm, calculate the coefficient of discharge and percentage slip of the pump. (5 marks)
5. In a pipe of diameter 200mm and length 500m, an oil of specific gravity 0.9 and viscosity 0.06 poise is flowing at a rate of 0.06m3/s, find the heat lost due to friction and power required to maintain flow. (6 marks)
6. The discharge through a pipe is 200 literes/s. Find the heat loss when the pipe suddenly enlarges from 150mm to 300mm diameter. (5 marks)

**QUESTION TWO (15 MARKS)**

1. Three pipes 400mm, 200mm and 300mm diameters have lengths 400mm, 200mm and 300mm respectively. They are connected in series to make a compound pipe. The ends of the compound pipe are connected with two tanks whose difference in water level is 16m. If the coefficient of friction for these pipes is the same and equal to 0.005, determine discharge through the pipe considering minor losses. (9 marks)
2. An oil of viscosity 0.1Ns/m2 and relative density of 0.9 flows through a circular pipe of diameter 50mm and length 300m, the rate of flow through the pipe is 3.5 litres/s. Find the pressure drop in 300m and shear stress at the pipe wall. (6 marks)

**QUESTION THREE (15 MARKS)**

1. Show that when a fluid flows between two parallel plates of distance h and length l, the velocit8y V of flow of an elemental strip at distance Y from the axis at the plate is given by



Where p is pressure difference between the ends of the plates and is the coefficient of viscosity. (9 marks)

1. A horizontal pipe carries water at a rate of 0.03m3/s, it contracts abruptly from 150mm diameter to 100mm. If the coefficient of contraction is 0.6, find the pressure loss across the contraction (6 marks)

**QUESTION FOUR (15 MARKS)**

1. A single acting reciprocating pump has plonger if diameter 300mm and stroke 200mm, if the speed of the pump is 30rpm and actual discharge is 6.5 litres/s of water. Find coefficient of discharge and percentage slip. If overall efficiency is 75% what power is required to drive the pump if the section lift is 4mj and delivery load is 30m. (10 marks)
2. Water at 200c leaks through a horizontal slot 0.25 mm deep, 100mm brad and 150mm long. If the pressure is 34kN, find the rate of leakage. (5 marks)