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**University Examinations 2015/2016**

**SECOND YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING**

**EMC 2251 : FLUID MECHANICS II**

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**DATE: NOVEMBER, 2015 TIME:** $1½$ **HOURS**

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

**QUESTION ONE – (30 MARKS)**

1. Using Chezy’s formula determine the head lost due to friction in a pipe 8 cm diameter and 35m long, the velocity of flow is 2 m/s and Chezy’s constant is 100. (5 Marks)
2. Oil of viscosity 0.048 kg/ms flows with a mean velocity of 0.3 m/s. Calculate the pressure drop over a 45 m long pipe, also calculate the velocity at a distance 3mm from the wall.

(6 Marks)

1. With help of a neat sketch explain the operation of a reciprocating pump. (6 Marks)
2. Radial clearance between a plunger and the walls of a cylinder is 0.075mm, the length of the plunger is 250mm and diameter 100mm, the pressure difference of water on the two ends of the plunger is 207 KN/$m^{2}$and the viscosity is 1.31 x $10^{-3}$kg/m-s, treating the flow as if occurring between parallel plates estimate the rate of leakage. (6 Marks)
3. Define the following terms in relation o reciprocating pumps: theoretical discharge actual discharge and slip. (3 Marks)
4. Find the head lost when a 200 mm diameter pipe suddenly doubles in diameter if the rate of flow is 0.25 m3/s

**QUESTION TWO (15 MARKS)**

1. Show that the loss of pressure due to laminar flow in a horizontal circular pipe is given by *P*= $\frac{32 μLV}{d^{2}}$ , where $μ$ is he viscocity, **V** is the mean velocity, **L** and **d** are length and diameter of the pipe. (10 Marks)
2. Water at 20oC leaks through a horizontal slot 0.25 mm deep, 100 mm broad and 150 mm long, the pressure difference is 34 KN/$m^{2}$, find the rate of leakage. (5 Marks)

**QUESTION THREE (15 MARKS)**

1. Show that the discharge through a circular pipe is given by Q= $\frac{πPd^{4}}{128μL}$ , where **p** is pressure difference, **d** is diameter, $μ$ is the viscosity and $L$ is the length of the pipe. (8 Marks)
2. A single acting reciprocating pump has a plunger of diameter 30 cm and stroke 20 cm, the speed of the pump is 30 rpm and delivers 6.5 litres / second of water. Calculate the coefficient of discharge and percentage slip of the pump. (7 Marks)

**QUESTION FOUR (15 MARKS)**

1. The discharge of water through a horizontal pipe is 0.25$ m^{3}$/s its diameter which is 200 mm suddenly enlarges to 400mm. If the intensity of pressure of water in the smaller pipe is 120KN/$m^{2}$, determine; Loss of head due to enlargement, pressure in the larger pipe and power lost due to enlargement. (9 Marks)
2. Find the loss of head when pipe carrying water abruptly changes from 150 mm diameter to 100 mm diameter. If the coefficient of friction is 0.6 find the pressure loss across the contraction. (6 Marks)