THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A constituent College of JKUAT)

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION)
DIPLOMA IN MECHANICAL ENGINEERING (PLANT)
DIPLOMA IN MECHANICAL ENGINEERING (AUTOMOTIVE)

EME 2302: FLUID MECHANICS I

YEAR III SEMESTER I

SPECIAL/SUPPLEMENTARY EXAMINATION
MAY 2012 SERIES
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

- Answer booklet
- Scientific Calculator
- Drawing Instruments

This paper consists of **FIVE** questions
Attempt any **THREE** questions. Maximum marks for each part of a question are as shown.

This paper consists of 3 printed Pages

Question ONE

a) Derive from first principles the loss of head due to friction, and show that

$$hf = \frac{4fLV^2}{2gd}$$

Where: f = Coefficient of friction

L = Length of pipe

V = Velocity of fluid

d = decimals of pipe

(13marks)

b) Calculate the loss of head due to friction in a pipe 300mm long and 150m diameter when the discharge is 2.7m^3/min and due resistance coefficient f = 0.01

(7marks)

Question TWO

a) Show that the loss of head which occurs when flow passes through sudden contraction in a pipeline is given by:-

$$\left(\frac{1}{Cc} - 1\right)^2 \frac{V_2{}^2}{2g}$$

Loss of head (

Where Cc is the coefficient of contracts

$V_2{}^2$ is the velocity after sudden contraction. *(10marks)*

b) A pipe carrying 0.06m^3/sec suddenly contracts from 200mm to 150mm diameter. Assuming that a vena contractor is formed in the smaller pipe. Calculate the coefficient of contraction of the pressure head at a point upstream of the construction is 0.655m greater than at a point just downstream of the Vena contractor. *(10marks)*

Question THREE

Water is discharged from the atmosphere through a pipe 39m long. There is a sharp entrance to the pipe and the diameter is 50mm from the entrance. The pipe then enlarges suddenly to

75mm in diameter for the remainder of the length. Taking into account the loss of need al country and al enlargement:-

Calculate the difference of level between the surface of the research and due pipe exit which will maintain a flow of $2.8dm^3/sec$.

Take f as 0.0048 for the 50mm pipe and 0.0058 for the 75mm pipe. *(20marks)*

Question FOUR

Two reservoirs have a difference of level of 6m and are connected by a pipe line which consists of a single 600mm diameter pipe 3000m long feeding a junction from which two pipers each of 300mm diam and 3000m long, lead in parallel to the lower reservoir. If

f = 0.01.

(i) Sketch the arrangement

(ii) Calculate the total discharge from first principles. *(20marks)*

Question FIVE

a) Show that the condition of maximum power transmitted by a pipe line is given by:-

$hf = \frac{1}{3}H$

hf Where is the head lost in friction and H is the head al Intel. *(10marks)*

b) Calculate the maximum power available at the far end of a pipeline. 4.8Km long and 200mm in diameter when water at 6900KN/m2 pressure is fed in at the rear end. Take $f = 0.007$ the coefficient of friction .

(10marks)