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 2305: FLUID MECHANICS II

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.

Question ONE

a) (i) State the meaning of "model Analysis" in fluid mechanics
   (ii) Define the following terms:-
      I. Kinematic similarity
      II. Geometric similarity
      III. Dynamic similarity
   (iii) State the difference between a model and a profitype.   (9marks)
b) List FIVE dimensionless numbers.   (5marks)
c) State FIVE advantages of centrifugal pumps over reciprocating pumps. (5marks)
d) Define the following with reference to centrifugal pumps
   i) Suction head
   ii) Delivery head
                                                                        (4marks)
e) (i) Define carination
   (ii) State TWO precautions to be taken against cavitations
   (iii) State THREE effects of cavitations
                                                                        (7marks)

Question TWO

(a) Show that the force exerted by a jet on a stationary plate is given by $\dfrac{ea\sigma^2}{e}$

   Where a is the density of liquid striking the jet

      σ Crossection area of the jet

      Velocity of the jet

(b) A jet of water of diameter 25mm strikes a 20mm x 20mm square plate of uniform section (see fig. below) with a velocity of 10m/secat the centre of the plate which suspended vertically by a hinge on its top horizontal edge the weight of the plate is 98.1N. The jet strikes normal to the plate
   (i) Calculate the force that must be applied the plate is kept vertical.
   (ii) If the plate is allowed to deflect freely, calculate the inclination of the plate with the vertical due to the force excerpted by jet of water.
                                                                        (13marks)

Question THREE

(a) (i)   Define specific speed of a centrifugal pump

    (ii)   Show that the specific speed of a centrifugal pump is given by:-

$$N8 = \frac{NQ^{\frac{1}{2}}}{H^{\frac{3}{4}}}$$

Where N is the rotational speed of impeller

        Q the discharge

        H the operating head

(13marks)

(b) Two geometrically similar pumps are running at the same speed of 100 r.p.m One pump has an impeller diameter. Of 0.30 metres and lifts water at the rate of 20 litres per second against a head of 15 metres

(c) Calculate the head and impeller diameter of the other pump to deliver half the discharge.

Question FOUR

Question FIVE

(10marks)