TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING
DIPLOMA IN MECHANICAL ENGINEERING (DMEN)
(PLANT OPTION)
(AUTOMOTIVE OPTION)
(PRODUCTION OPTION)

EME 2302
FLUID MECHANICS I

END OF SEMESTER EXAMINATIONS

YEAR 3 SEMESTER 1

SERIES: DECEMBER, 2013

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1.   You should have the following for this examination:
   - Answer Booklet
   - Scientific Calculator
   - Drawing Instruments

2.   This paper consists of **FIVE** Questions.
3.   Answer **ANY THREE** Questions.
4.   All Questions carry equal marks.
5.   **This paper consists of FOUR printed pages.**
Question ONE

(a)   A differential manometer is connected at the two points A and B as shown below.   At
B air pressure is 9.81N/cm².
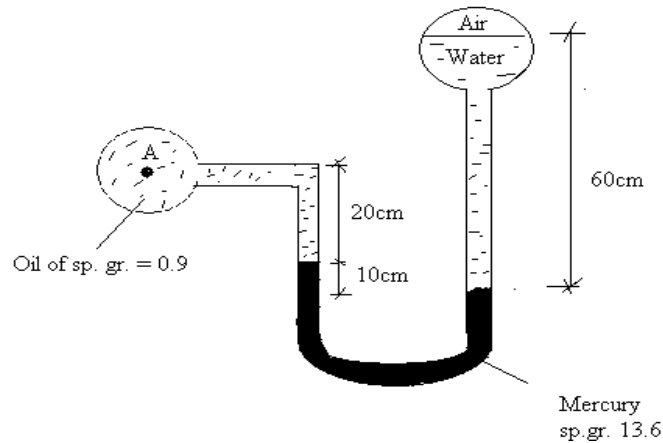
        Calculate the pressure at A.

                                                                                            (10 marks)


(b)   The diameters of a small piston and a large piston of a hydraulic jack are 3cm and 10cm
        respectively. A force of 80N is applied on the small piston. Find the load lifted by the large
        piston when:
        (i)   The pistons are at the same level
        (ii)   The small piston is 40cm above the large piston

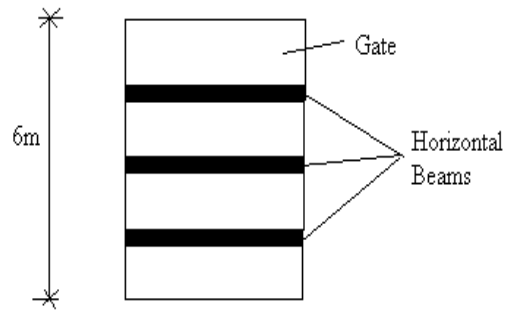   **Note:** Sketch both the arrangements in (i) and (ii) above

                                                                                            (10 marks)

Question TWO

A dock gate is to be re-informed with three horizontal beams. If the water acts on one side only, to a
depth of 6m, calculate the position of the beams measured form the water surface so that each will
carry an equal load. Give the load per meter.   **(20 marks)**

Gate

6m

Horizontal Beams
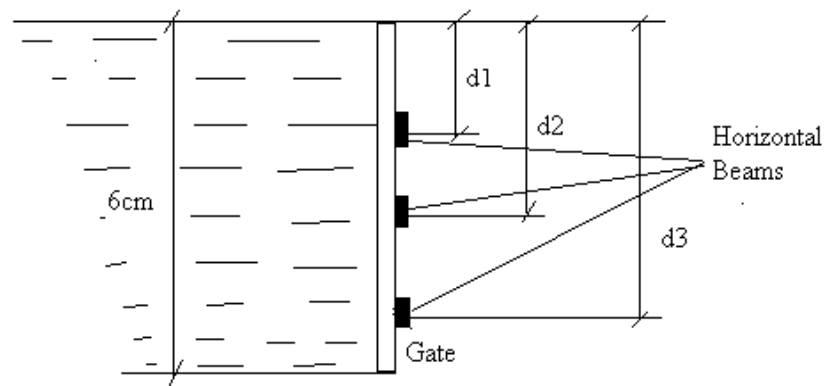
Question THREE

A siphon of diameter 200mm connects two reservoirs whose water surface level differs by 40m. The total length of the pipe is 800m the pipe crosses a ridge. The sumit of the ridge is 8m above the water level of water in the upper reservoir. If the absolute pressure head at the sumit of siphon is not to fall below 3.0m of water. Given that f = 0.006 and atmospheric pressure head = 10.3m of water. The length of siphon from the upper reservoir to the summit is 500m. Calculate:

    (i)   The minimum depth of the pipe below the summit of the ridge x.
    (ii)   The discharge
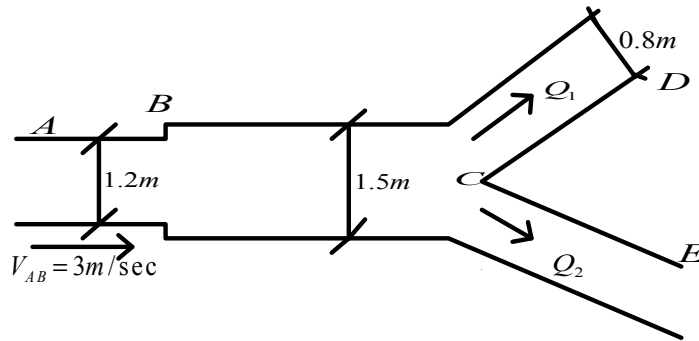
(20 marks)
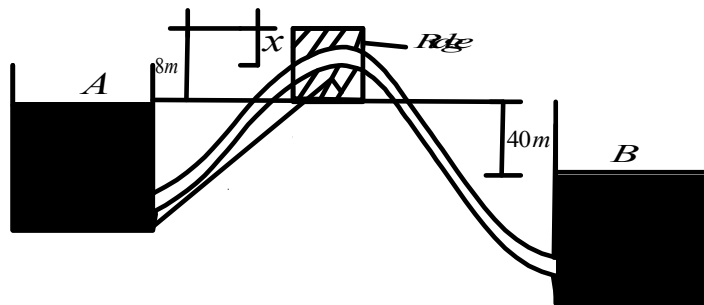
Question FOUR

Water flows through a pipe AB 1.2m diameter at 3m/sec and then passes through pipe branches. Branch CO is 0.8m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5m/sec. Calculate:

(i)   The flow rate in AB
(ii)   The velocity in BC
(iii)   The velocity in CD
(iv)   The diameter of CE

NB: Ignore losses due to sudden enlargement.

(20 marks)

Question FIVE

(a)   Show that for maximum power transmission through a pipe is given by:

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

where:

hf   =   Loss of head due to friction
H   =   Total head available at the inlet of the pipe

(b)   A pipe of diameter 300mm and length 3500m is used for the transmission of power by water. The total head at the outlet of the pipe is 500m. Calculate the maximum power available at the outlet of the pipe. Take the value of f = 0.0006.

(20 marks)