



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND SEMESTER EXAMINATION FOR DIPLOMA MECHANICAL ENGINEERING

MED-PR 108: FLUID MECHANICS I

DATE: 4/8/2016

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

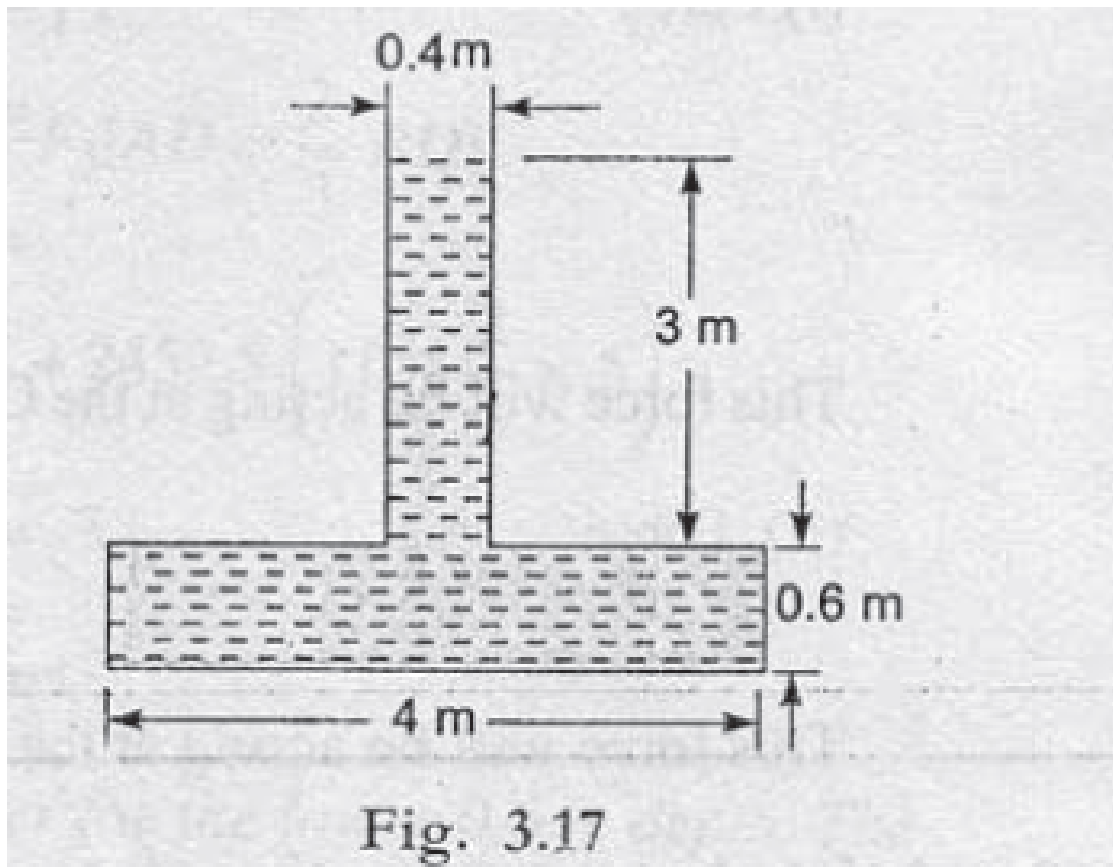
Answer all questions in Section A and any two in Section B.

SECTION A. (ANSWER ALL QUESTIONS)

1. a) Define the following terms: (5 marks)
 - i. Pascal's law.
 - ii. Specific gravity.
 - iii. Specific weight.
 - iv. Density.
 - v. Specific volume.
- b) Differentiate between ideal and real fluids. (2 marks)
- c) List and explain with a diagrammatic representation two fluid differential manometer. (5 marks)
- d) A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of Centre of pressure on the plane surface when its upper edge is horizontal and;- (8 marks)
 - i. Coincides with water surface.
 - ii. 2.5m below the free water surface.

SECTION B. (ANSWER ANY TWO QUESTIONS)

2. a) The figure below shows a tank full of water. Find:-
- Total pressure on the bottom of tank.
 - Weight of water in tank.
 - Hydrostatic paradox between the result in (i) and (ii).



- b) A rectangular plane surface 3m wide and 4m deep lies in water in such a way that its plane makes an angle of 30° with the free surface of water determine the total pressure force and position of centre, when the upper edge is 2m below the free surface. (12 marks)

3. a) Find the magnitude and direction of the resultant force due to water acting on a roller gate of cylindrical form of 4.0m diameter, when the gate is placed on the dam in such a way that water is just going to spill. Take the length of the gate as 8.0m. (10 marks)
- b) Find the volume of the water displaced and position of centre of buoyancy for a wooden block of width 2.5m and depth 1.5m when it floats horizontally on water. The density of the wooden block is 650kg/m^3 and its length is 6.0m. (10 marks)
4. a) i) A uniform body of size 3m long, 2m wide and 1m deep floats on water. What is the weight of the body if depth of immersion is 0.8m?
ii) Determine meta-centric height. (10 marks)
- b) i) What is an orifice meter? (2 marks)
- ii) An orifice meter with orifice diameter of 15cm is inserted in a pipe of 30cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury. Find the rate of flow of oil of specific gravity of 0.9 when the coefficient of discharge of meter = 0.64. (8 marks)
5. a). A pitot - static tube placed in the centre of a 300mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60mm of water. Take the coefficient of pitot tube as $C_p = 0.98$ (10 marks)
- b) Determine the height of rectangular weir of length 6m to be built across a rectangular channel. The maximum depth of water on the upstream side of the weir is 1.8m and discharge is 2000 litres/s. take $C_d = 0.6$ and neglect end contractions. (10 marks)