



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

TMC 4212: FLUID MECHANICS I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

- a. Define the following terms
 - i) An open channel (1mk)
 - ii) Uniform flow (1mk)

- b. A canal is rectangular in cross-sector and conveys $11.3\text{m}^3/\text{s}$ of water with a velocity of 1.8m/s . calculate the gradient required (i) if the proportions are those for maximum discharge (8mks) (ii) if the width is three times the depth; $C= 66$ SI Units. (5mks)

- c. In an experiment the weight of 2.5m^3 of a certain liquid was found to be 18.75hn . Calculate; (i) the specific weight of the liquid (ii) density. (15mks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

- a) I A simple manometer containing mercury is used to measure the pressure of water flowing in a pipeline. The mercury level is higher than on the left tube if the height of



water in the left tube is 50mm, determine the pressure in the pipe in terms of head of water (5mks)

- b) A rectangular plate 2m wide and 4m deep is immersed in water in such a way that its plane makes an angle of 25° with the water surface as shown in the figure below;

Determine the total pressure on one side of the plate and the position of the centre of pressure (15mks)

QUESTION THREE (20 Marks)

- a) Show from first principle that the theoretical rate of flow through a rectangular notch is given by $Q = \frac{2}{3} B (2g)^{1/2} H^{3/2}$ where B= width of notch and H = height of the water level above the bottom of the notch. (7mks)
- b) Explain why this experiment requires modification in practice (3mks)
- c) Explain the application of the principle of Archimedes on a floating body (10mks)

QUESTION FOUR (20 Marks)

- a) A rectangular open channel has a width B of 4.5m and a slope of (i) vertical to 800 horizontal. Calculate the mean velocity of flow V and (ii) discharge Q when the depth D of water is 1.2m, if C in the Chezy formula is 49 in SI units (10mks)
- b) Calculate the head H of water corresponding to an intensity of pressure P of 340000 N/m^2 . (2mks)
- c) A cylindrical tank 60cm in diameter with its axis vertical is filled to a depth of 150cm with water, calculate the;
- i) Total pressure on the curve surface (4mks)
- ii) Resultant pressure on this surface. (4mks)

QUESTION FIVE (20 Marks)

- a) Define the following
- i) Mass density (1mks)
 - ii) Kinematic viscosity (2mks)
 - iii) Specific height (1mk)
 - iv) Specific gravity (1mk)
- b) A jet of water of 75mm diameter at its base rises vertically 18m. calculate its diameter at a height of 12m. (8mks)
- c) A vessel of 4m^3 volume contains an oil, which weighs 30.2kn. calculate the specific gravity of the oil. (7mks).