



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293

Website: [www.must.ac.ke](http://www.must.ac.ke) Email: [info@must.ac.ke](mailto:info@must.ac.ke)

---

## University Examinations 2019/2020

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN AUTOMOTIVE  
ENGINEERING

AND

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL  
ENGINEERING

### EMC 2202: FLUID MECHANICS

DATE: OCTOBER 2020

TIME: 1½ HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions.

---

#### QUESTION ONE (30 MARKS)

- a) State Pascal's law (2 marks)
- b) List four similarity laws which are used in dimensional analysis. (4 marks)
- c) Give the difference between Real and Ideal fluid. (4 marks)
- d) (i) Explain the use of piezometer or pressure tube to measure the intensity of pressure in a liquid. (5 marks)  
(ii) A pressure tube is used to measure the pressure of oil (mass density  $\rho = 640 \text{ kg/m}^3$ ) in a pipe line. If the oil rises to a height of 1.4m above the centre of the pipe, what is the gauge pressure in  $\text{N/m}^2$  at that point. (4 marks)
- e) Calculate the specific weight, specific mass and specific gravity of a liquid having a volume of  $8 \text{ m}^3$  and weight of 40KN. (6 marks)

- f) List three mechanical gauges that are used in pressure measurement. (3 marks)
- g) Find the intensity of pressure on the water in contact with the underside of the piston if the piston is in equilibrium. The mass  $M$  acting on the piston is 60kg and the area  $A$  of the piston is  $100\text{cm}^2$ . Take gravity to be  $9.81\text{N/kg}$ . (2 marks)

### QUESTION TWO (15 MARKS)

- a) Show that the intensity of pressure at a point in a fluid at rest is the same in all directions. (10 marks)
- b) Find the head  $h$  of water corresponding to an intensity of pressure  $p$  of  $400,000\text{ N/m}^2$ . The mass density  $\rho$  of water is  $10^3\text{kg/m}^3$ . Take gravity to be  $9.81\text{N/kg}$ . (3 marks)
- c) Give the major reason why Rayleigh's method of dimensional analysis is regarded as obsolete and not favourable for use. (2 marks)

### QUESTION THREE (15 MARKS)

- a) The diameters of a ram and plunger of an hydraulic press are 200mm and 26mm respectively.
- (i) Draw a neat sketch of the hydraulic press. (3 marks)
- (ii) Find the weight lifted by the hydraulic press when the applied at the plunger is 600N. (4 marks)
- b) Discuss four properties of fluid. (8 marks)

### QUESTION FOUR (15 MARKS)

- a) Draw a neat sketch of a mercury barometer and explain how it works. (10 marks)
- b) The figure below shows a circular plate of diameter 1.2m placed vertically in water in a such a way that the centre of the place is 2.7m below the free surface of water.
- Determine:
- (i) Total pressure on the plate (2 marks)
- (ii) Position of the centre of pressure (3 marks)

