Instructions:

1. Answer question 1 (compulsory) and ANY other 2 questions.
2. Candidates are advised not to write on the question paper.
3. Candidates must hand in their answer booklets to the invigilator while in the examination room.
4. 
QUESTION 1

a) Using dimension analysis approach, find out if the equation \( V^2 = u^2 + 2as \) is dimensionally correct (where \( V \) = final velocity; \( u \) = initial velocity; \( a \) = acceleration; \( S \) = distance) (6 marks)

b) Briefly describe any Three properties of fluid (6 marks)

c) Find the pressure head \( (H) \) of water corresponding to an intensity \( (P) \) of 340,000 N/m\(^2\), if mass density of water is \( 10^3 \) kg/m\(^3\) (6 marks)

d) Using sketch diagrams, distinguish between turbulent and laminar flow of fluids (6 marks)

e) Using well labeled diagrams, distinguish between a manometer measuring fluid condition under (i) positive pressure and (ii) negative pressure (6 marks)

QUESTION 2

a) Derive a mathematical expression distinguishing between the pressure exerted over solid surfaces and the pressure exerted on liquids (6 marks)

b) The Mercury-U-Tube Manometer (figure below) measures the pressure of water at A, which is below atmospheric pressure.
If the specific weight of Mercury is 13.6 times that of water at atmospheric pressure (101.3KN/m), what is the absolute pressure at A when \( h_1=15\text{cm}; h_2=30\text{cm}; \) Specific weight of water \( = 9.81 \times 10^3\text{N/m}^3 \)

(14 marks)

**QUESTION 3**

Pressure intensity of a plane surface immersed in water at depth \( x \) is given as \( \rho g x \). Prove that total pressure is given as \( wA\ddot{x} \) (where \( w=\rho g \)) and that this pressure is similar for (i) a horizontally immersed plane surface, (ii) a vertically immersed plane surface and (iii) an inclined plane surface

(20 marks)

**QUESTION 4**

a) A rectangular plate 2m x 3m is immersed in water in such a way that its greatest and least depths are 6m and 4m respectively from the water surface. Calculate the total pressure on the plate

(8 marks)

b) Using a sketch diagram of a curved surface immersed in water, generate mathematical expressions for (i) total pressure on curved surfaces and (ii) angle of inclination of the resultant pressure

(12 marks)

**QUESTION 5**

a) State the three laws of physics from which dynamics of fluid flow are derived

(6 marks)

b) In reference to a control volume of pipe flow, derive Bernoulli’s equation from the principle of conservation of energy

(14 marks)