Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Even) Semester Examination May-June 2025

Roll no.....

Name of the Program and semester: **B Tech., 4th Semester**
Name of the Course: **Fluid Mechanics and Fluid Machines**
Course Code: **TME 407**

Time: 3 hour Maximum Marks: 100

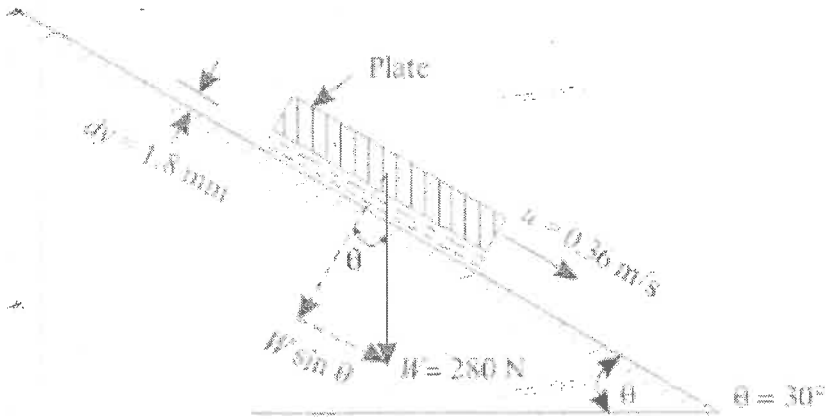
Note:

(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1 (2X10=20 Marks)

a. Explain the concept of continuum. Can you define concept of surface tension in terms of energy? Calculate the work done in blowing a soap bubble of diameter 10cm. Assume the surface of soap solution=0.04 N/m. **(CO1, CO2, CO6)**

b. A plate having an area of 0.6 m^2 is sliding down the inclined plate at 300 to the horizontal with a velocity of 0.36 m/s. There is a cushion of fluid 1.8 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 280 N. **(CO6)**



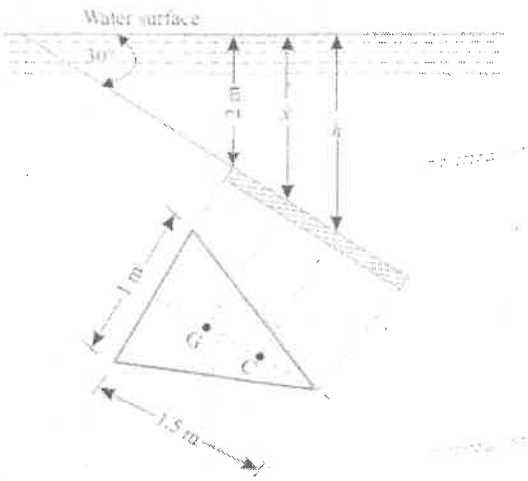
c. What is newton law of viscosity? Discuss following fluids: (i) Dilatant, (ii) Pseudo plastic, (iii) Bingham Plastic along with their shear stress relation with viscosity. **(CO1, CO2)**

Q2. (2X10=20 Marks)

a. What is meta center and meta centric height? Discuss the stability of fully submerged and floating bodies. **(CO1, CO2)**

b. Define U tube manometer. Figure shows a differential manometer connected at two points A and B. At A air pressure is 100 kN/m^2. Find the absolute pressure at B. **(CO6)**

End Term (Even) Semester Examination May-June 2025



b. Differentiate between laminar and turbulent flow. Any five. What is the condition for a flow to be laminar, turbulent, and transient in pipes? **(CO2, CO3)**

c. What is orifice meter? The water is flowing through a tapering pipe having diameters 300 mm and 150 mm at a sections 1 and 2 respectively. The discharge through the pipe is 40 litres/sec. The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/m^2. **(CO3, CO6)**

Q4. (2X10=20 Marks)

a. what are the major and minor losses in pipes? Derive the expression for head loss in pipes. **(CO3)**

b. Discuss the working principle of Pelton turbine with neat sketch. What are the differences between Pelton turbine and Francis turbine? **(CO5)**

c. Define the following: (i) momentum thickness, (ii) Displacement thickness, (iii) Energy thickness and (iv) boundary layer thickness with relevant expression. **(CO1, CO2)**

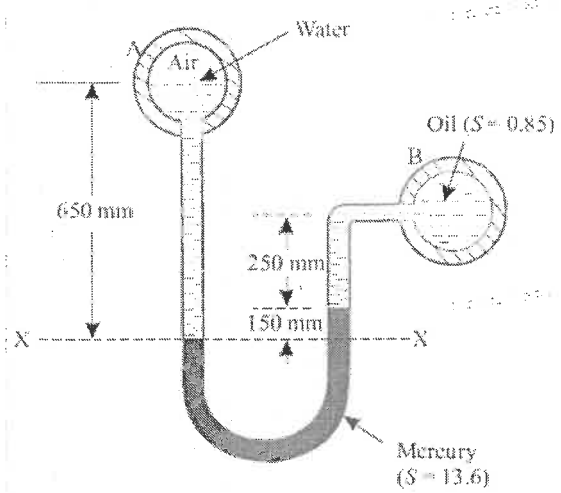
Q5 (2X10=20 Marks)

a. Discuss the construction and working principle of centrifugal pump. **(CO5)**

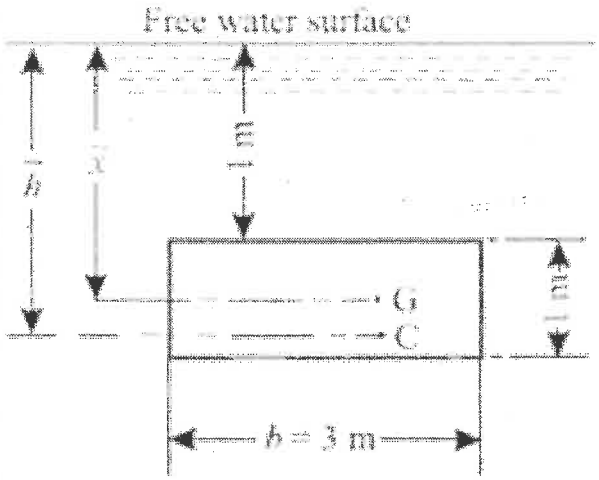
b. Explai n Impulse turbine with neat sketch and derive the expression for efficiency. **(CO5)**

c. Write a short note on net positive suction head. Why it is so important for a pump to be working efficiently? **(CO4, CO6)**

End Term (Even) Semester Examination May-June 2025



c. A rectangular plate 3 m long and 1 m wide is immersed vertically in water in such a way that its 3 m side is parallel to the water surfaces and is 1 m below it. Find (i) Total pressure on the plate and (ii) Position of centre of pressure. **(CO6)**



Q3. (2X10=20 Marks)

a. A triangle plate of 1 m base 1.5 m altitude is immersed in water. The plane of the plate is inclined at 300 with free water surface and the base is parallel to and at a depth of 2 m from water surface. Find the total pressure on the plate and the position of centre pressure. **(CO6)**