4E1310
B. Tech. IV - Sem. (Main) Exam., - 2022
Automobile Engineering
4AE4-05 Fluid Mechanics and Fluid Machines
AE, ME

Time: 3 Hours　　　　　　　　　　　　　　　　**Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A. Five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____　　　　　2. NIL _____

PART – A

(Answer should be given up to 25 words only)　　　　[10×2=20]

All questions are compulsory

Q.1　What are the different properties of liquid?

Q.2　Define Newtonian and Non – Newtonian fluids.

Q.3　What is a manometer? How are manometers classified?

Q.4　Explain the terms metacenter and metacentric height.

Q.5　State Buckingham's π - theorem.

Q.6 Explain the terms coefficient of contraction, coefficient of velocity and coefficient of discharge.

Q.7 Define the terms hydraulic efficiency, mechanical efficiency.

Q.8 Define the terms: Suction head, delivery head and manometric head.

Q.9 State the Pascal's law.

Q.10 What do you understand by center pressure?

PART – B

(Analytical/Problem solving questions) [5×4=20]

Attempt any five questions (Word limit 100)

Q.1 A plate 0.5mm distance from a fixed plate moves at 0.25m/s and requires a force per unit area of 2.0 N/m² maintain this speed. Determine the viscosity of the fluid between the plates.

Q.2 Derive an expression for the pressure within a droplet of water.

Q.3 In the manometer shown in figure, find the pressure P_A of the air inside bulb A.
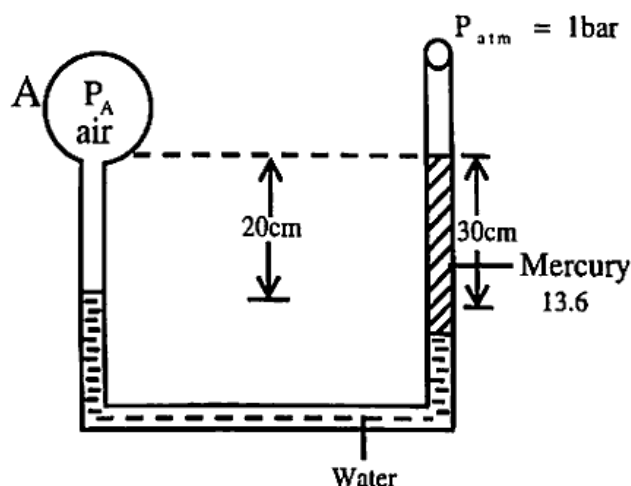
Q.4 Derive an expression for the hydrostatic pressure on an inclined surface immersed in a liquid.

Q.5 A stone weighs 500 N in air and 200 N in meter. Determine the volume of stone and its specific gravity.

Q.6 A pump delivers 0.02 m³/s against head of 16m with a rotational speed of 1750 rpm. Find the specific speed.

Q.7 A turbine develops 5000 kW when running at 80 rpm. The head in the turbine is 20m. If the head on the turbine is increased to 30m, determine the speed and power developed by the turbine.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [3×10=30]
Attempt any three questions

Q.1 Derive an expression for the depth of center of pressure of vertical surface immersed in a liquid.

Q.2 Derive an expression for the metacentric height of a floating body.

Q.3 State and prove Bernoulli's theorem for flow liquids.

Q.4 Define the term specific speed of a centrifugal pump and deduce an expression for it in terms of the head H, discharge Q and speed N.

Q.5 Find an expression for the head lost due to friction in suction and delivery pipes in a reciprocating pump.