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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Civil Engineering

Semester End Examination; March / April - 2022

Fluid Mechanics

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of basic science and mathematics to differentiate a fluid and a solid, understand fluid properties, differentiate pressure and pressure head, analyze the fluid particles at rest or in motion and to understand flow measurement phenomenon.

CO2: Formulate, interpret and analyze flow problems related with fluid particles either at rest or at motion.

CO3: Identify and quantify losses in a flow phenomenon for the efficient design of pipe line and various flow measuring devices.

CO4: Apply the knowledge of fluid mechanics in future to find efficient solutions to various problems related to civil engineering either as an individual or as a team member to satisfy the changing professional and societal needs.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Define the following terms and mention their units: i) Specific mass ii) Specific gravity	2	L1	CO1	PO1
b.	State Hydrostatic and Pascal's law.	2	L1	CO1	PO1
c.	State Bernoulli's equation as applied to fluid dynamics.	2	L1	CO1	PO1
d.	Define hydraulic gradient line and total energy line.	2	L1	CO1	PO1
e.	Define Notches and weirs.	2	L1	CO1	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Define the following terms with usual notations: i) Newtonian and Non-Newtonian fluids ii) Ideal and Real fluids ii) Dynamic viscosity and Kinematic viscosity	9	L1	CO1	PO1
b.	A 600 mm squares plate weighing 245 N slides down an inclined plane at a slope of 1 in 2.4 with a uniform velocity of 0.30 m/s with a 1 mm thick oil film. Calculate the dynamic viscosity of the oil.	9	L3	CO2	PO2
c.	A liquid weighs 7.25 *N/lt*. Calculate unit weight, density, specific volume and relative density of the liquid.	9	L3	CO2	PO2
	UNIT - II	**18**			
2 a.	Critically differentiate between the following terms: i) Atmospheric and gauge pressure ii) Simple and differential manometer iii) Centroid and centre of pressure	9	L2	CO2	PO2

Contd... 2

b. In the arrangement shown in Fig. 2(b) determine the volume of 'h'

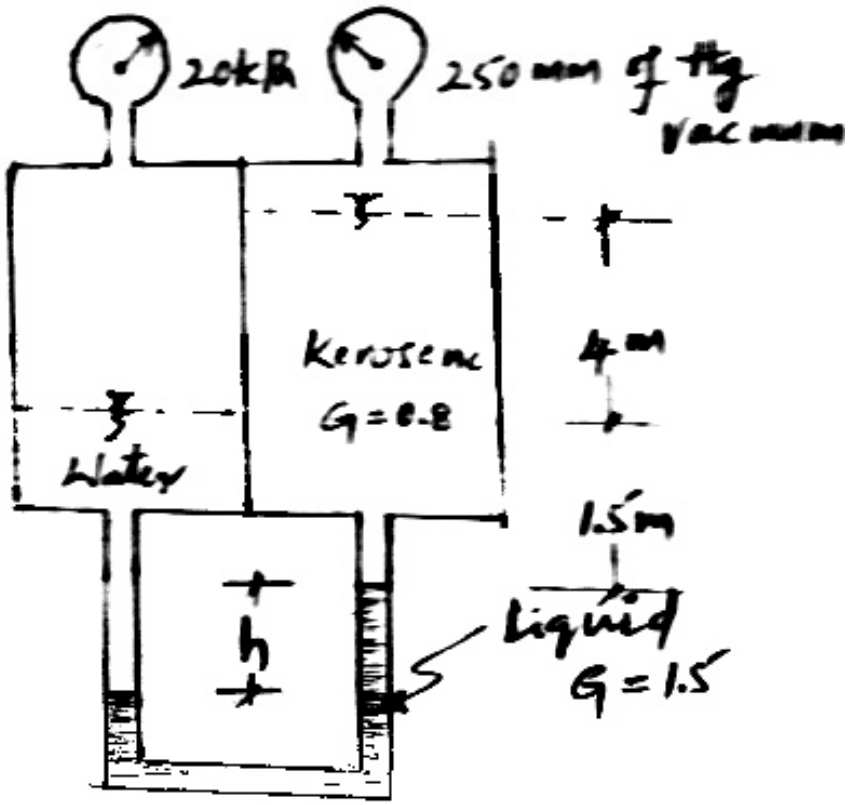

fig. 2 b)

9 L2 CO1 PO1

c. A circular opening, 3 m in diameter in vertical side of the water tank is closed by a disc 3 m diameter which can rotate about a horizontal diameter. Compute;

i) Force on the disc

ii) The torque required to maintain, disc in equilibrium in the vertical position, when the head of water above the horizontal diameter is 4 m

9 L3 CO2 PO2

UNIT - III **18**

3 a. Critically differentiate the following terms:

i) Uniform and non-uniform flow

ii) Laminar and turbulent flow

iii) Rotational and irrotational flow

9 L2 CO2 PO2

b. Write Euler's equations of motion along a stream line and integrate it to obtain Bernoulli's equations.

9 L3 CO2 PO2

c. In a 45° bend a rectangular air duct of 1 m^2 c/s area is gradually reduced to 0.5 m^2 area. Calculate the magnitude and direction of force required to hold the air duct in position, if the velocity of flow at 1 m^2 section is 10 m/s and pressure is 30 kN/m^2. Take specific weight of air as 0.0116 kN/m^3.

9 L3 CO2 PO2

Contd... 3

UNIT - IV **18**

4 a.	Mention the expressions for major and minor losses in flow through pipes.	9	L2	CO2	PO2
b.	Enumerate the phenomenon of water hammer. List the factors affecting water hammer and mention the expressions when value is gradual and sudden closure.	9	L3	CO2	PO2
c.	The differences in water surface levels in two tanks, which are connected by three pipes in series of lengths 450 m, 255 m and 315 m and diameters 300 mm, 200 mm and 400 mm respectively is 18 m. Compute the flow rate of water if co-efficient of frictions are 0.0075, 0.0078 and 0.0072 respectively. Consider; i) Minor losses ii) Neglecting minor losses.	9	L3	CO3	PO2

UNIT - V **18**

5 a.	Derive an error of 1% in the head measurement produces an error of 1.5% in the discharge over rectangular notch and produces an error of 2.5% in the discharge over a triangular notch.	9	L3	CO2	PO2
b.	A tank containing water is provided with sharp edged orifice of 7.5 mm in diameter. The head of water in the tank is 1.44 m above orifice. The jet strikes a wall 1.5 m away and 0.42 m vertically below the centre line of the contracted section of jet. The actual discharge through the orifice is measured to be 35 litres in 4 minutes. Compute; i) Orifice coefficients ii) Power lost at the orifice	9	L3	CO4	PO2
c.	I) Define Cipolletti notch, list the advantages of Cipolletti notch over a trapezoidal notch. II) Critically differentiate between the following terms: i) Orifice and mouth piece ii) Notches and weirs	9	L2	CO1	PO1

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