Register Number:……..

KUMARAGURU
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B.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

MECHANICAL ENGINEERING

U18MEI4202**:** Fluid Mechanics and Machinery

COURSE OUTCOMES

CO1: State and explain various fluid properties.
CO2: Apply the knowledge of fluid statics for solving the problems in buoyancy and manometers.
CO3: Solve problems in mass, momentum and energy balance equations.
CO4: Determine the flow rate through Venturi-meter and orifice meter.
CO5: Analyze the performance of turbines and pumps.
CO6: Illustrate the various tools for solving fluid dynamic problems.

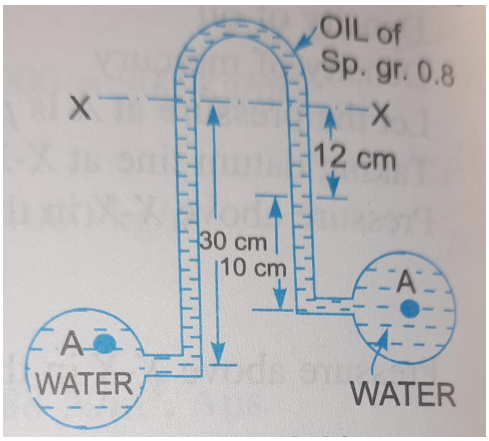
Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate kinematic viscosity from dynamic viscosity based on the terminology.	CO1	[K_2]
2.	Write the relationship between compressibility and bulk modulus of a fluid.	CO1	[K_1]
3.	Compare pressure and shear stress in a fluid flow with respect to momentum diffusivity.	CO2	[K_3]
4.	Write down the impact of meta center on designing a war ship and a passenger ship.	CO2	[K_1]
5.	Write the continuity equation in differential form.	CO3	[K_1]
6.	Compare Bernoulli's equation with steady flow energy equation of a thermodynamic system.	CO3	[K_2]
7.	Define coefficient of discharge.	CO4	[K_1]
8.	Classify turbines based on flow topology.	CO5	[K_1]
9.	Give the cause of cavitation in pumps.	CO5	[K_2]
10.	Annotate about the necessity of the process of discretizing the computational domain in solving a fluid flow problem numerically.	CO6	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8 m x 0.8 m and an inclined plane with angle of inclination 30^o. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm. Also sketch the figure.	16	CO1	[K_3]

12.	Water is flowing through two different pipes to which an inverted differential manometer having an oil of specific gravity 0.8 is connected. The pressure head in the pipe A is 2 m of water; find the pressure in the pipe B for the manometer readings as shown in Figure below. 	16	CO2	[K3]
13.	Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end of the pipe is connected to a tank and other end of the pipe is open to the atmosphere. The pipe is horizontal and height of water in the tank is 4m above the center of the pipe. Consider all minor losses and take f=0.009 in the Dacrcy – Weisbach equation.	16	CO3	[K3]
14.	The head of water over an orifice of diameter 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of diameter 1.5 m. The rise of water level in this tank is 1.0 min 25 seconds. Also the co-ordinates of appoint on the jet, measured from vena-contracta are 4.3 m horizontal and 0.5 m vertical. Find the co-efficient of discharge.	16	CO4	[K3]
15.	A Pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 liters/s under a head of 30 meters. The buckets deflect the jet through an angle of 160°. Calculate the power given by the water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98.	16	CO5	[K3]
16.	Explain the step-by-step procedure to solve a two dimensional Newtonian and incompressible fluid flow problem numerically using commercial software.	16	CO6	[K2]

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