Code No: R1922034 **R19** SET - 1

II B. Tech II Semester Supplementary Examinations, February - 2022
FLUID MECHANICS & HYDRAULIC MACHINES
(Mechanical Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	Explain the Pascal's law. Prove that pressure acting on wedge submerged in fluid is equal in all directions.	8M
	b)	A differential manometer is connected to two pipes whose centers are at 3m difference in height. Higher level pipe is carrying liquid of specific gravity of 0.9 at a pressure of 1.8 bar and another pipe is carrying liquid at specific gravity of 1.5 at a pressure of 1 bar. The centre of pipe carrying low pressure liquid is 2m above the higher level of the mercury in the manometer. Find out the difference in mercury level in the manometer in cm.	7M
		Or	
2	a)	A metal ball weighs 9500N in air and 8000N in water .Find out its volume and specific gravity.	7M
	b)	Define following fluid properties : Density, weight density, specific volume and specific gravity of fluid.	8M
3	a)	State Bernoulli's equation? Write the assumptions for such a derivation?	7M
	b)	A pipe of 300m diameter conveying $0.30m^3$ /s of water has a right angled bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are $24.525N/cm^2$ and $23.544N/cm^2$.	8M
		Or	
4	a)	What are the different losses in flow through the circular pipes.	7M
	b)	Derive the Darcy-Weisbach equation for friction head loss in a pipe.	8M
5	a)	What are the different methods of preventing the separation of boundary layers?	7M
	b)	Using Buckingham"s π theorem, Examine whether the velocity through a circular pipe orifice is given by, $V = \sqrt{2gH}\phi$ [D/H , $\mu/ \rho vH$] where H = Head causing flow, D = diameter of orifice, μ = coefficient of viscosity ρ = mass density, g = acceleration due to gravity.	8M
		Or	
6	a)	Define energy thickness. Derive an expression for the energy thickness.	7M
	b)	How will you find the drag on a flat plate due to laminar and turbulent boundary layers?	8M
7	a)	Differentiate between i) Impulse and Reaction turbine ii) Radial and Axial flow Turbines iii) Inward and Outward Radial flow turbines	8M
	b)	A Kaplan turbine works under a head of 60m at a speed of 145rpm utilizing $175m^3$ /s of water. Diameter of runner and hub are 5.60m & 3.20m. Turbine develops 82500 kW. Find i) flow ratio ii) speed ratio iii) overall efficiency iv) specific speed.	7M
		Or	

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8 a) Explain what is meant by unit quantities in turbines. Derive expressions for unit speed, unit discharge and unit power of a turbine. 7M

b) A jet of water of diameter 100 mm strikes a curved plate at its centre with a velocity of 15 m/sec. The curved plate is moving with a velocity of 7 m/sec in the direction of the jet. The jet is deflected through an angle of 150^0. Assuming the plate is smooth find (i) force exerted on the plate in the direction of the jet (ii) power of the jet (iii) efficiency. 8M

9 a) What is the working principle of a reciprocating pump? Explain its working with the help of an indicator diagram. 7M

b) A centrifugal pump having an overall efficiency of 80% delivers 1850 liters of water per minute to a height 0f 20 meters through a pipe of 100mm diameter and 95 meters length. Taking $f = 0.0075$, find the power required to drive the pump. 8M

Or

10 a) Explain with neat sketch the operation and utility of hydraulic ram. 7M

b) A double acting reciprocating pump of cylinder diameter 300mm and stroke of 400mm is situated at a height of 3.50 meters above the sump water level. The suction pipe is 150mm in diameter and 6 meters long. If the pump runs at 25 rpm, calculate the absolute pressure head in the cylinder on the suction side at the commencement of the stroke. Take atmospheric pressure head = 10.3 meters of water. 8M