Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | | |

Fourth Semester B.E. Degree Examination
Title-Fluid Mechanics

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	CO	Marks
Q.01	a	A vertical gap 2.2 cm of infinite extent contains a fluid of viscosity 2 Ns/m^2 and specific gravity 0.9. A metallic plate 1.2m x 1.2m x 0.2cm is to be lifted up with a constant velocity of 0.15 m/s, through the gap. If the plate is in middle of gap, find the force required to lift the plate upwards. The weight of plate is 40 N.	L5	CO1	10
	b	Derive an expression for Capillary rise of water in a glass tube	L2	CO1	6
	c	Explain vapour pressure and cavitation	L2	CO1	4
		OR			
Q.02	a	An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axis of these pipes is 30 cm. When an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes.	L5	CO1	10
	b	Derive an expression for total piessure and center of pressure for an inclined plane surface submerged in liquid	L2, L3	CO1	10
		Module-2			
Q. 03	a	A cylindrical buoy is 2 m in diameter 2.5 m long and weighs 2.2 metric tons. The density of sea water is 1025 kg/m^3. Show that the body cannot float with its axis vertical.	L5	CO2	10
	b	Derive an expression for the metacentric height of a floating body	L2	CO2	10
		OR			
Q.04	a	Derive an expression for continuity equation in 3D, in differential form for steady incompressible fluid flow.	L2	CO2	10
	b	Prove that velocity potential function and stream function satisfy the laplace equation	L5	CO2	10
		Module-3			
Q. 05	a	Derive Bemotrlli's equation from Euler's equation and also explain terms used. State Bemoulli's theorem for steady flow of an incompressible fluid	L1,L2	CO3	10
	b	A pump has a tapering pipe running full of water. The pipe is placed vertically with the diameters at the base and top being 1.2 m and 0.6 m respectively. The pressure at the upper end is 240 mm of Hg vacuum, while the pressure at the lower end is 15 kN/m^2. Assume the head loss to be 20% of difference of velocity head. Calculate the discharge, the flow is vertically upwards and difference of elevation is 3.9 m.	L5	CO3	10

		OR			
Q. 06	a	Derive an expression for discharge through orifice meter	L2	CO3	10
	b	A vertical venturimeter has an area ratio 5. It has a throat diameter of 10 cm. When oil of specific gravity 0.8 flows through it the mercury in the differential gauge indicates a difference in height of 12 cm. Find the discharge through the venturimeter. Take C_d = 0.98.	L5	CO3	10
		Module-4			
Q. 07	a	Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity ω, speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by the speed of sound in the medium C .	L5	CO4	10
	b	Define and derive an expression for Reynold's number, Froude's Number and Weber's Number, Mach's number and Euler's number.	L1, L2	CO4	10
		OR			
Q. 08	a	Derive Darcy's formula to calculate the frictional head loss in a pipe.	L2	CO4	10
	b	At a sudden enlargement of a water main from 240mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow.	L5	CO4	10
		Module-5			
Q. 09	a	Derive an expression for lift and drag	L1, L2	CO5	10
	b	Derive momentum thickness and energy thickness for flow over thin plate.	L2	CO5	10
		OR			
Q. 10	a	Prove that maximum velocity is equal to one and a half times the average velocity for viscous flow between two parallel plates when both plates are stationary.	L4, L5	CO5	10
	b	Derive an expression for velocity of sound wave in a fluid	L2	CO5	10

*****Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.