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

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Fourth Semester B.E. Degree Examination

Subject Title :Fluid Mechanics (18MR46)

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

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define dynamic viscosity and kinematic viscosity with SI units.	L_1	4
	b	Explain capillarity .Obtain on expression for capillarity in a small diametered tube, when immersed in static liquid.	L_2	8
	c	The pressure inside a droplet of water is 0.02 N/cm^2 greater than the atmospheric pressure. Calculate the diameter of the droplet. Assume surface tension of water with air is 0.0725 N/m.	L_3	8
		OR		
Q.02	a	State and prove Pascal law for static fluid.	L_2	6
	b	Derive an expression for total hydrostatic force on a flat surface completely submerged in static liquid and inclined at an angle 'θ' to the free surface.	L_3	8
	c	A circular plate 4m in diameter is placed in such a way that its top vertex is 2m below the water surface and bottom vertex end is 5m below the free surface. Find out the total pressure acting on the plate and its location	L_3	8
		Module-2		
Q. 03	a	Define meta centric height and derive relation for meta centric height of a floating vessel by analytical method.	L_1, L_2	10
	b	The stream function for a fluid flow is represented by Ψ=2xy. Show that the flow is continuous and irrotational. Find the velocity potential fuction.	L_3	10
		OR		
Q.04	a	Differentiate between following. (i) Steady and unsteady fluid flow. (ii) Rotational and irrotational fluid flow (iii) Compressible and Incompressible flow. (iv) Viscous and Non viscous fluid flow.	L_2	10
	b	A pipeline is carrying gasoline, sp.gr. 0·8 changes in its diameter from 20 cm to 50 cm in a height of 5m. The pressure at the 20 cm and 50 cm diameter are 100 Kpa 60 Kpa respectively. The rate of flow is 0.2m^3/sec. Find the loss of head during flow and direction of flow.	L_3	10
		Module-3		
Q. 05	a	Define the term notch and derive an expression for discharge of water flow through a V-Notch.	L_1, L_2	10
	b	Water flows through a rectangular notch of 1.2m width and depth of water over the notch is 16.5cm. Water coming out from notch is a right angled triangular notch. Determine the depth of water over triangular notch. Assume C_d (rect)=0·62, C_d (tri)=0·60.	L_3	10
		OR		
Q. 06	a	Explain Dimension Analysis and its application in model study.	L_1	10
	b	The specific speed of a water turbine is given by Ns=N$\sqrt{P}$/H$^{5/4}$. Speed of turbine depends on density ρ, Head H, Power P, diameter 'd' gravity 'g' , N is speed. By Buckingham Π method, obtain the relation.	L_3	10

Module-4				
Q. 07	a	Define the terms (i)Reynolds number (ii) TEL, HGL (iii) loss of head due to sudden contraction	L2	6
	b	Derive on expression for lass of head for a fluid flow through pipe with sudden expansion.	L2	6
	c	Two tanks are connected by a pipeline of diameter 30cm and length 2.5 km. The Difference in water level between tanks is 10m. Find the diameter of pipe which would provide twice the discharge of the first pipe. Consider only friction losses and friction factory 'f' is same.	L3	8
OR				
Q. 08	a	For viscous flow through a circular pie of uniform diameter, derive relation for loss of head across the pipe length 'L' and average velocity 'V'	L2	10
	b	Oil is pumped through pipeline of diameter 8cm, length 1 km. Viscosity of oil is 0.1 $\frac{N.s}{m^2}$ and density 900 $\frac{kg}{m^3}$. Power supplied to pump is 5.5 kw and pump efficiency is 80%. Find the rate of oil in lits /minute and Reynolds number.	L3	10
Module-5				
Q. 09	a	Define following terms (1) lift force (2) drag force (3) displacement thickness.(4) Energy thickness.	L2	10
	b	Water flows with velocity of 1.2 m/s over a smooth flat plate 5m x 2m in size with the side 5m as length. Laminar flow exists on the plate till $Re=5x10^5$. Determine length of the laminar flow thickness of boundary layer at end of laminar flow and drag force on the plate. Assume $\rho=1000\ \frac{kg}{m^3}$ and $\mu=1x10^{-2}$ N.s/M^2. Neglect the transition length.	L3	10
OR				
Q. 10	a	Derive on expression for velocity of sound in a compressible fluid.	L2	10
	b	A jet plane travels at 1000 km/hr at an altitude where pressure and temperature are 70 $\frac{KN}{M^2}$ and -5^{o}C. Determine the velocity of sound and Mach number. Assume $\gamma=1.4$, $R=287\ \frac{N.m}{Kg\,K}$ for air.	L3	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.