C.U.SHAH UNIVERSITY **Summer Examination-2018**

Subject Name: Fluid Mechanics

	Subject Code: 4TE04FME1			Branch: B.Tech (Mechanical, Automobile)								
	Semester Instructio	Date: 26 /	/04/2018 Ti	me: 10:30 To 01:30	Marks: 70							
	 (1) U (2) I (3) I (4) A 	 Use of Programmable calculator & any other electronic instrument is prohibited. Instructions written on main answer book are strictly to be obeyed. Draw neat diagrams and figures (if necessary) at right places. Assume suitable data if needed. 										
Q-1	l	Attempt the followin	g questions:			(14)						
	А.	The property of fluid (a) Surface tension	by virtue of whi (b) Adhesion	ch it offers resistance (c) Cohesion	to shear is called (d) Viscosity							
	B.	is the ab (a) Vapour pressure (c) Compressibility	oility of fluid to c	hange its volume und (b) Surface tension (d) Capillary	er pressure. n							
	C.	 The bulk modulus of elasticity with increase in pressure (a) Increases (b) Decreases (c) Remains constant (d) Increases first up to certain limit and then decreases 										
	D.	The stress-strain rela (a) Linear	tion of the newto (b) Parabolic	nean fluid is (c) Hyperbolic	(d) Inverse type							
	Е.	Falling drops of wate (a) Surface tension	er become sphere (b) Adhesion	s due to the property ((c) Cohesion	of (d) Viscosity							
	F.	The resultant upward weight of the fluid di (a) Buoyancy (c) Archimedes' princ	d pressure of a splaced by the be	fluid on a floating body is equal to the body. This definition is according to (b) Equilibrium of a floating body (d) Bernoulli's theorem								
	G.	For a floating body to (a) Below the center	b be in stable equ of gravity	(b) Below the cen	re should be ter of buoyancy							
	Н.	Which of the following is the unit of kinematic viscosity Page 1 3										



		(a) Pascal	(b) Faraday	(c) Poise	(d) Stroke		
	I.	The equation of continuity holds good v (a) Is steady (c) Velocity is uniform at all the		vhen the flow(b) Is one dimensional(d) All of the above			
	J.	The flow along a closed curve is called (a) Ir-rotational flow (c) Circulation		(b) Rotational flow(d) Vorticity			
	K.	The ratio between ine (a) Froude's number (c) Mach number	ertia force with respo	bect to viscous flow is known as (b) Weber''s number (d) Reynold's number			
	L.	Flow having Mach number 1 is known (a) Sonic flow (c) Subsonic flow		as (b) Supersonic flow (d) Hypersonic flow			
	М.	A grid obtained by drawing series of known as (a) Flow net		equipotential lines and stream lines is (b) Potential function			
		(c) Stream function		(d) None			
	N.	 The fluid forces considered in the Navier-Stokes equation are (a) Gravity, pressure and turbulent (b) Gravity, pressure and viscous (c) Pressure, viscous and turbulent (d) Gravity, viscous and turbulent 					
Attemp	ot any f	our questions from Q	-2 to Q-8				
Q-2	a)	Attempt all question Explain the condition diagram	1s 1 of stability for a s	ubmerged and floa	ting body with neat	(07)	
	b)	 Explain the following i. Surface tension ii. Cavitation iii. Metacenter iv. Dynamic viscov v. Specific gravit vi. Ideal fluid vii. Bulk modulus 	g terms: on osity ty			(07)	
Q-3		Attempt all questions					
:	a)	Derive Euler's equation of motion. Also state and derive Bernoulli's equation.					
	b) Explain stream function and potential function for uniform flow. A stream function is given by $\psi = x^2 - y^2$. Determine the corresponding velocity						

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potential function.

Q-4 Attempt all questions

- a) Write a brief note on Inverted U tube manometer. (03)
- **b**) Obtain an expression for capillary rise of liquid.
- c) What is venturimeter? Derive an expression for the discharge through a (07) venturimeter.

(04)

(07)

Q-5 Attempt all questions

- a) Two plate spaced at 5 mm distance creates shear stress0.25 N/m², when upper (03) plate is moving at a velocity of 2.5 m/s. if the mass density of oil is 900 kg/m³. Find the dynamic and kinematic viscosity of oil.
- b) A pipe is having diameters 30 cm and 15 cm at the cross sections 1 and 2 (04) respectively through which water is flowing. The velocity of water at section 1 is given as 5 m/s. Determine the velocity head at section 1 and 2, and flow rate in a pipe.
- c) Explain briefly:
 - i. Steady flow and unsteady flow
 - ii. Uniform flow and non-uniform flow
 - iii. Laminar flow and turbulent flow
 - iv. Rotational flow and irrotational flow

Q-6 Attempt all questions

- a) Explain Buckingham's π theorem for dimensional analysis. (07)
- b) Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 25 N/cm² and the pressure at the upper end is 10 N/cm². Determine the difference in the datum head if the rate of flow through pipe is 45 lit/sec.

Q-7 Attempt all questions

- a) Derive equation for total pressure and center of pressure for vertically (07) immersed surface.
- b) Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe. (07)

Q-8 Attempt all questions

- a) Derive an expression of continuity equation for 3-D flow and reduce it for (07) steady, incompressible 2-D flow in Cartesian coordinate system.
- b) Define Mach number. Derive the equation for velocity of sound wave in a (07) compressible fluid in terms of bulk modulus and density.



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