Enrollment No:-_____ Exam Seat No:-_____

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 4TE04FME1 **Subject Name: Fluid Mechanics**

Course Name: B.Tech (Auto) Date: 21/5/2015

Semester: IV Marks: 70

Time: 02:30 TO 05:30

Instructions:

1) Attempt all Questions in same answer book/Supplementary.
2) Use of Programmable calculator & any other electronic instrument prohibited.
3) Instructions written on main answer book are strictly to be obeyed.
4) Draw neat diagrams & figures (if necessary) at right places.
5) Assume suitable & perfect data if needed.

SECTION-I

Q-1 Attempt the following.

	(a)	Define the following terms: (I) Total pressure (II) Centre of pressure.	02
	(b)	Define atmospheric pressure, gauge pressure.	02
	(c)	Define cavitations and effect of cavitations.	02
	(d)	Define Viscosity.	01
Q-2	(a)	Explain Variation of viscosity with temperature.	04
	(b)	Discuss types of Fluid.	05
	(c)	Velocity components of a fluid flow are given as $u = (6xy^2 + t)$, $v = (3yz + t^2 + 5)$, $w = (z + 3ty)$, where x, y, z are given in meters and time t in seconds. Determine velocity vector at point P (4, 1, 2) at time t = 3 seconds. Also determine the magnitude of velocity and acceleration of the flow for given location and time.	05

OR

Q-2	(a)	State Buckingham's π-theorem. How are the repeating variables selected in dimensional analysis?	04
	(b)	State and prove Pascal's law.	05
	(c)	A solid cylinder of diameter 4 m has a height of 3 m. Find the metacentric height of the cylinder if the specific gravity of the material of cylinder is 0.6 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable.	05
Q-3	(a)	Derive an expression for the depth of centre of pressure from free surface of liquid of an Inclined plane surface sub-merged in the liquid.	07
	(b)	The resistant force R of a supersonic plane during flight can be considered as a dependent upon the length of aircraft L, velocity V, air viscosity, air density ρ and bulk modulus of air K. Express the functional relationship between these variable and the resistance force Using Buckingham's π-theorem.	07

OR

Q-3 (a) Define the capillarity. Derive an expression for capillary rise & capillary fall. 07

(b) A rectangular body 2 m long, 1 m wide and 1 m deep floats in water. The depth of immersion is 0.8 m. What is the weight of the body? Is the body in stable equilibrium? Specific weight of sea water = 1.025. 07

SECTION-II

Q-4 Attempt the following.

(a) Define: (I) Subsonic flow (II) Sonic flow. 02

(b) Define Following Hydraulic coefficient 02
(I) Coefficient of Discharge (II) Coefficient of Contraction

(c) State the assumptions made for derivation of Bernoulli's theorem? 02

(d) State the application of Notch & Weir. 01

Q-5 (a) Derive an expression for the measurement of velocity of flow at any point in a pipe or channel by Pitot tube. 04

(b) With usual notations derive the expression for the discharge through a triangular notch. 05

(c) Derive euler's equation of motion. 05

OR

Q-5 (a) State the characteristics of Turbulent flow 04

(b) Prove that the velocity at the outlet of nozzle for maximum flow rate equals sonic velocity. 05

(c) Derive Darcy – Weisbach equation for the loss of head due to friction in pipes. 05

Q-6 (a) Derive the expression for shear stress and velocity distribution for the flow of viscous fluid in between two parallel fixed plate. 07

(b) An Orificemeter with orifice diameter 15cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by mercury oil deferential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury. Determine the rate of flow of oil sp. gr. 0.9 when the coefficient of discharge is 0.64. 07

OR

Q-6 (a) What is Orificemeter? Derive an expression for the discharge through an Orificemeter. 07

(b) An oil of viscosity 6 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.4 m and it rotates at 190 rpm. Calculate the power lost in oil for a sleeve length of 90 mm. The thickness of oil film is 1.5 mm. 07