Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name : Fluid Mechanics

Subject Code : 4TE04FME1 **Branch: B.Tech (Mechanical,Automobile)**

Semester : 4 **Date : 05/05/2017** **Time : 02:00 To 05:00** **Marks : 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) Define fluid. **01**

b) Define adhesion. **01**

c) Define centre of pressure. **01**

d) State the continuity equation for incompressible flow. **01**

e) Which type of notch has reasonably stable value of discharge co-efficient for different operating conditions? **01**

f) State name of any 1 efflux viscometer. **01**

g) Define sonic flow. **01**

h) Define Mach Number **01**

i) The volumetric change of the fluid caused by a resistance is known as **01**
(a) volumetric strain
(b) volumetric index
(c) compressibility
(d) adhesion

j) Which of the following is dimensionless **01**
(a) specific weight
(b) specific volume
(c) specific speed
(d) specific gravity

k) A balloon lifting in air follows the following principle **01**
(a) law of gravitation
(b) Archimedes principle
(c) principle of buoyancy
(d) all of the above

l) Choose the correct relationship **01**
(a) specific gravity = gravity x density
(b) dynamic viscosity = kinematic viscosity x density

(c) gravity = specific gravity x density
(d) kinematic viscosity = dynamic viscosity x density

m) For manometer, a better liquid combination is one having **01**
(a) higher surface tension
(b) lower surface tension
(c) surface tension is no criterion
(d) high density and viscosity

n) The property of fluid by virtue of which it offers resistance to shear is called **01**
(a) surface tension
(b) adhesion
(c) cohesion
(d) viscosity

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) State, explain and prove Pascal's law for fluid. **07**

b) Derive formula to determine Metacentric height using analytical method. **07**

Q-3 **Attempt all questions** **(14)**

a) What is Venturimeter? Derive an expression for the discharge through a Venturimeter. **07**

b) Describe journal, foot step and collar bearing. **03**

c) Explain Reynold's experiment **04**

Q-4 **Attempt all questions** **(14)**

a) A plate 0.03 mm distant from fixed plate moves at 70 cm/s and requires force per unit area equal to 3 N/m^2 to maintain this speed. Calculate fluid viscosity between the plates. **03**

b) State and explain various types of pressure with neat sketch. **04**

c) Derive the expression for velocity distribution and ratio of maximum velocity to average velocity for viscous flow through circular pipes. **07**

Q-5 **Attempt all questions** **(14)**

a) State and explain various model or similarity laws **04**

b) State and explain various similarities between model and prototype. **03**

c) Water flows over a rectangular weir of width 1.5 m at a depth of 10 cm and then passes through a triangular right angled weir. Determine the depth of water through triangular weir. Take discharge co-efficient for the rectangular and triangular weir as 0.63 and 0.58 respectively. **07**

Q-6 **Attempt all questions** **(14)**

a) The lift force F_L on the air foil depends upon the mass density of medium ρ, velocity of flow V, characteristic length l, viscosity μ, and angle of incidence α. Obtain an expression for the lift force using Buckingham's π-theorem. **07**

b) The head of water over an orifice of diameter 30 mm is 9 m. Find the actual discharge and actual velocity of the jet at vena-contracta. Take C_d= 0.62 and C_v= 0.98. Also calculate co-efficient of contraction. **07**

Q-7 **Attempt all questions** **(14)**

a) Derive Euler's equation of motion along a stream line and hence generate Bernoulli's equation. **07**

	b)	Derive Continuity equation for 3D.	**07**
Q-8		**Attempt all questions**	**(14)**
	a)	Discuss various cases for propagation of pressure waves in a compressible fluid.	**07**
	b)	Derive Darchy- Weisbach equation for the head loss due to friction in pipes.	**07**