Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Level : B. Tech. Course : MEEG 218
Year : II Semester : I
Exam Roll No. : Time: 30 mins. F. M. : 20
Registration No.: Date : FEB 25 2019

SECTION "A"
[20 Q. × 1 =20 marks]

Tick the most appropriate answer.

1. Which branch of fluid mechanics deals with naturally occurring flows
[ ] Meteorology [ ] Hydrology
[ ] Oceanography [ ] All of above

2. Which of the following characteristics is most suitable to the property of fluid
[ ] deforms continuously under the influence of a shear stress
[ ] deforms proportionately under the influence of a shear stress
[ ] deforms linearly under the influence of a shear stress
[ ] deforms inversely under the influence of a shear stress

3. Which of the following is the signifies to the control volume
[ ] fixed volume in space [ ] arbitrary volume in space
[ ] fixed mass in space [ ] fixed volume in space

4. Specific gravity of mercury is 13.6 implies
[ ] its weight is 13.6 times heavier than water
[ ] its mass is 13.6 times heavier than water
[ ] its weight and mass is 13.6 times heavier than water
[ ] its volume is 13.6 times heavier than water

5. Ideal plastic fluid is defined as
[ ] fluid in which behaves like a Newtonian fluid when stressed applied beyond yield stress
[ ] fluid in which no deformation when stressed up to a yield stress and beyond that it behaves like a Newtonian fluid
[ ] fluid in which shear stress is not proportional to rate of shear strain
[ ] fluid for which the consistency index 'n' is greater than unity

6. Cavitation phenomenon is closely related to
[ ] Vapor pressure [ ] Surface Tension
[ ] Capillary effect [ ] Viscosity

7. Which of the following statements about the pressure scales is true
[ ] Gage pressure is always above atmospheric pressure
[ ] Vacuum pressures is always below atmospheric pressure
[ ] Absolute pressure is measured relative to vacuum pressure
[ ] All of above

8. Which of the following statements about the buoyancy is true
[ ] the buoyant force acting on a body immersed in a fluid is equal to the weight of the fluid displaced by the body
[ ] the tendency of the body to be lifted upward in a fluid due to buoyant force is called buoyancy
[ ] the line of action of the buoyant force is vertical and passes through the centroid of the displaced fluid
[ ] all of above

9. Which device are used for velocity measurement of fluid through an open channel flow
[ ] Orifice meter [ ] Ventry meter [ ] Pitot tube [ ] Weir and notch

10. Transition flow regime is characterized by
[ ] sudden change of flow from laminar to turbulent
[ ] gradual change of flow from laminar to turbulent
[ ] fluctuating change of flow from laminar to turbulent
[ ] ordered change of flow from laminar to turbulent

11. The flow at constant rate through a converging or diverging pipe is
[ ] steady uniform flow [ ] non-steady uniform flow
[ ] non-steady and non-uniform flow [ ] steady non-uniform flow

12. Which of the following presents the instantaneous snapshot of a time-integrated flow pattern
[ ] Streakline [ ] Pathline [ ] Streamline [ ] Timelines

13. The law of conservation of energy is governed by
[ ] Impulse momentum equation [ ] Continuity Equation
[ ] Bernoulli Equation [ ] Linear momentum equation

14. Boundary layer thickness if dependent only upon the Reynold's number for
[ ] Laminar flow [ ] Turbulent flow [ ] Transition flow [ ] None of above

15. The dimensional homogeneity means
[ ] every term in an equation must have the same dimensions
[ ] every additive term in an equation must have the same dimensions
[ ] non-dimensional terms in the equation are of order unity
[ ] variables and constants in each terms of product has same dimensions

16. For the equation $\theta_0 = f(m,t,g,l)$, with standard symbols, number of Ω terms are
[ ] 5 [ ] 4 [ ] 3 [ ] 2

17. Dynamic Force exerted by the fluid is equal to
[ ] rate of change of momentum of fluid
[ ] rate of change of linear momentum of fluid
[ ] rate of change of angular momentum of fluid points
[ ] rate of change of kinetic energy of fluid

FEB 25 2019

18. Which of the following is the governing equations used for CFD studies
[ ] Continuity equation [ ] Equation of motion
[ ] Navier-Stokes Equations [ ] All of above

19. Which of the following is not a dimensionless parameter
[ ] Reynolds number [ ] friction factor
[ ] kinematic viscosity [ ] pressure coefficient

20. Orifice Meter is gives the velocity of flow by measuring
[ ] differential area [ ] differential pressure
[ ] differential energy [ ] differential momentum

Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

FEB 25 2019

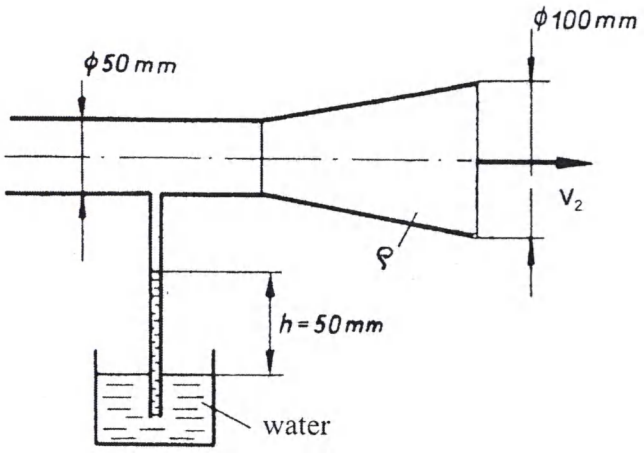
Level : B. Tech.
Year : II
Time : 2 hrs. 30 mins.

Course : MEEG 218
Semester : I
F. M. : 55

SECTION "B"
[5 Q. × 11 = 55 marks]

Attempt *ALL* questions.

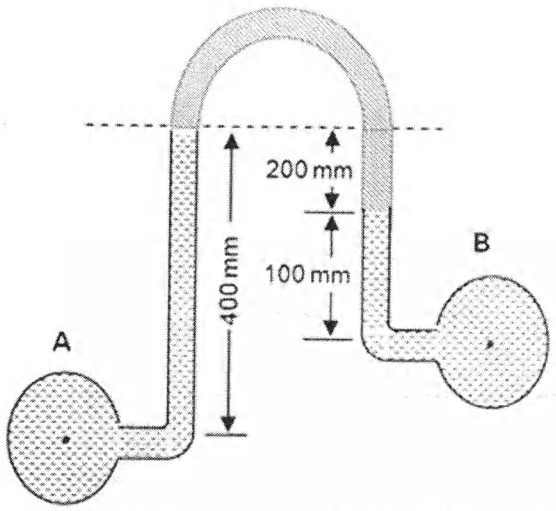
1. a. Explain the effects of viscosity on the formation of boundary layer in fluids. [3]
   b. Draw a suitable diagram to show resultant force and center of pressure on the inclined surface immersed in a fluid. [3]
   c. If density of fluid in the following figure is 1.2 kg/m^3 find the velocity at section 2. [5]



2. a. Discuss the relationship between the restoring moment, overturning moment and metacenter for a submerged body. [3]
   b. Give examples for the cases where Langrangian method and Eulerian method each is helpful to examine the flow characteristics. [3]
   c. What are the different methods of pressure measurements commonly applied the fluid flow applications. Discuss the principle of flow measurement by nozzle meter [2+3]

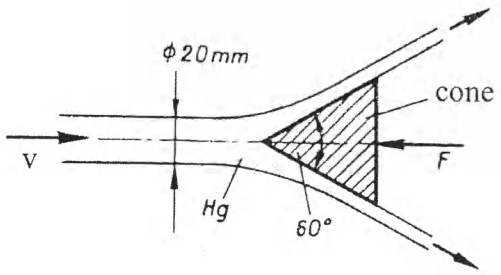
3. a. Apply continuity equation for steady-flow processes to derive expression for discharge through a pipe. [3]
   b. Draw the diagram of a flow over a flat pate to show with velocity gradient and boundary layer. [3]
   c. Discuss the principles of generation of lift and drag in airfoils and discuss the application of lift to drag ratio to govern in-flight angle of attack range. [3+2]

4. a. An inverted tube differential manometer having an oil of specific gravity 0.9 is connected to two different pipes carrying water under pressure. Determine the pressure in the pipe B. The pressure in pipe A is 2 m of water. [3]



b. At a certain point in an oil the shear stress is 0.2 N/m^2 and the velocity gradient is 0.21 s^{-1}. If the mass density of the oil is 950 kg/ m^3 find the kinematic viscosity. [3]

c. The initial velocity of the free jet (V) in the following figure is 10 m/s, if the density of the fluid is 13600 kg/m^3, calculate the force acting on the cone. [5]



5. a. Discuss the limitations on the use of the Bernoulli equation [3]

b. Derive the Euler's equation of motion for a fluid flow. [3]

c. The power required by a pump in a tank is a function of the following variables:

i. Diameter of the impellor
ii. Number of rotations of the impeller per unit time
iii. Viscosity of liquid
iv. Density of liquid

From dimensional analysis using Buckingham's method, obtain a relation between power and the four variables [5]