

11. All the terms of energy in Bernoulli's equation have dimension of
 energy work mass length
12. The flow in which conditions do not change with time at any point is known as
 uniform steady streamline turbulent
13. During the opening of a valve in a pipeline, the flow is
 steady unsteady uniform laminar
14. Two pipe systems can be said to be equivalent, when the following quantities are same
 friction loss and flow length and diameter
 flow and length velocity and diameter
15. For pipes, turbulent flow occurs when Reynolds number is
 less than 2000 between 2000 and 4000
 more than 4000 less than 4000
16. The dimensions of coefficient of viscosity are
 $[M^1L^{-1}T^{-1}]$ $[M^{-1}L^{-1}T^{-1}]$ $[M^1L^1T^{-1}]$ $[M^{-1}L^1T^1]$
17. Which of the following is not a dimensionless parameter
 Reynolds number friction factor
 kinematic viscosity pressure coefficient
18. For hypersonic flow, the Mach number is
 equal to 1 greater than 1 greater than 2 greater than 4
19. An isentropic process is
 adiabatic and irreversible adiabatic and frictionless
 reversible and isothermal any adiabatic process
20. An aircraft moves at 1580 km/h in an atmosphere where the temperature is -60°C . If $k = 1.4$ and $R = 287 \text{ J/kg K}$, the Mach number of the plane is
 0.67 1.5 2.1 5.4

KATHMANDU UNIVERSITY
End-Semester Examination
March/April 2017

APR 6 2017

Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : MEEG 301
Semester: I
F.M. : 55

SECTION "B"

[5 Q. × 11 = 55 marks]

Attempt *ALL* questions. Assume suitable data if necessary.

Q.N.1

- Explain the no-slip condition of a fluid with proper sketch. [3]
- A 0.6 mm diameter glass tube is inserted into water at 20 °C in a cup. Determine the capillary rise of water in the tube. Surface tension of water at 20 °C is 0.073 N/m. Assume angle of contact is 0°. [5]
- A vacuum gauge connected to a chamber reads 5.8 psi at a location where the atmospheric pressure is 14 psi. Determine the absolute pressure in the chamber. [3]

Q.N.2

- Differentiate between Lagrangian and Eulerian description in fluid mechanics. [2]
- With a proper sketch derive expression for hydrostatic force on a submerged plane. [4]
- The stream function for a two-dimensional flow is given by $\psi = 2xy$, calculate the velocity at the point P (2, 3). Find the expression for velocity potential function ϕ . [5]

Q.N.3

- Derive Bernoulli's equation considering a fluid particle along a streamline. [6]
- A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 l/s. Find the reading of the oil-mercury differential manometer. $C_d = 0.98$. [5]

Q.N.4

- Differentiate between internal and external flow. [2]
- Discuss the characteristic differences between laminar and turbulent velocity profile in circular pipes with sketches. [4]
- An oil of specific gravity 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 l/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take $\gamma = 0.29$ stokes and $C_f = \frac{0.079}{Re^{1/4}}$. [5]

Q.N.5

- Differentiate between static and stagnation properties. [2]
- List and explain briefly steps involved in dimensional analysis using Buckingham- π theorem. [4]
- Air at 1 MPa and 600 °C enters a converging nozzle with a velocity 150 m/s. Determine the mass flow rate through the nozzle for a nozzle throat area of 50 cm² when the back pressure is 0.7 MPa. Given $T_e/T_o = 0.892$ and $Ma_e = 0.778$ where subscript e denotes properties at exit of nozzle. [5]

