

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov.-Dec. 2015

B. Tech in Mechanical Engineering, Semester III

Roll No.....

ME 307: Fluid Mechanics

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Cavitation is caused by
 - (a) High velocity
 - (b) High Pressure
 - (c) Low velocity
 - (d) Low viscosity
- ii. Fluid is a substance which offers no resistance to the change of
 - (a) Pressure
 - (b) Flow
 - (c) Volume
 - (d) Temperature
- iii. In a static fluid
 - (a) Resistance to shear stress is small
 - (b) Fluid pressure is zero
 - (c) Linear deformation is small
 - (d) Only normal stresses can exist
- iv. Hg does not wet glass due to
 - (a) Compressibility
 - (b) Viscosity
 - (c) Cohesion
 - (d) Adhesion
- v. A balloon lifting in air follows the following principle
 - (a) Law of gravitation
 - (b) Archimedes principle
 - (c) Law of buoyancy
 - (d) all of the above
- vi. The dimension of surface tension is
 - (a) ML^{-1}
 - (b) L^2T^{-2}
 - (c) $ML^{-1}T^{-1}$
 - (d) MT^{-2}
- vii. What is the unit of dynamic viscosity of a fluid termed 'poise' equivalent to?
 - (a) dyne/cm²
 - (b) gm s/cm
 - (c) dyne s/cm²
 - (d) gm-cm/s
- viii. The capillary rise on depression in a small diameter tube is
 - (a) Directly proportional to the specific weight of the fluid
 - (b) Inversely proportional to the surface tension
 - (c) Inversely proportional to the diameter
 - (d) Directly proportional to the surface area
- ix. When can a piezometer be not used for pressure measurement in pipes?
 - (a) The pressure difference is low
 - (b) The velocity is high
 - (c) The fluid in the pipe is a gas
 - (d) The fluid in the pipe is highly viscous

- x. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I (Device)

- A. Barometer
B. Hydrometer
C. U-tube manometer
D. Bourdon gauge

Codes: A B C D

(a) 2 3 1 4

(b) 3 2 1 4

List-II (Use)

1. Gauge pressure
2. Local atmospheric pressure
3. Relative density
4. Pressure differential

Codes: A B C D

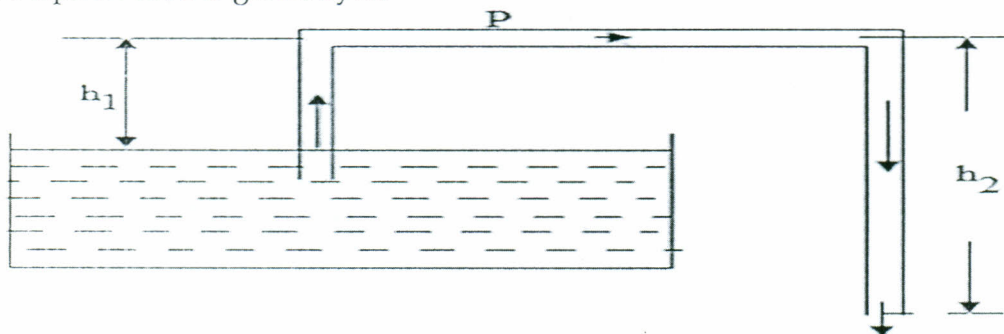
(c) 3 2 4 1

(d) 2 3 4 1

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

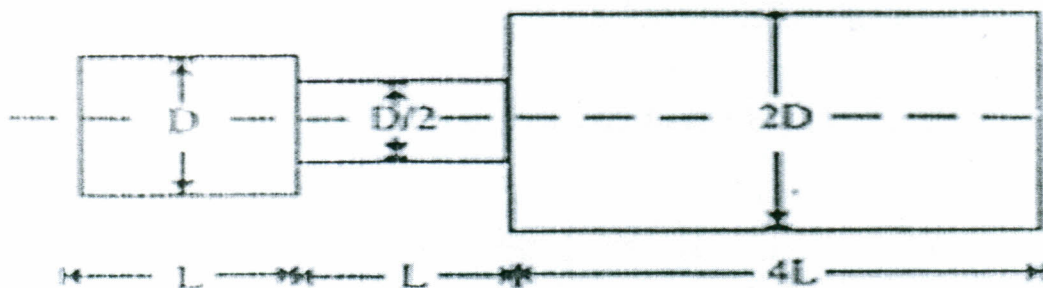
- What is critical Reynold number? What are the values of upper critical Reynold number and lower critical Reynold number for a pipe flow?
- What is Prandtl's mixing length theory?
- What is velocity defect? Give the expression.
- Express an absolute pressure of 4 atmospheric in meters of water gauge when barometer reads 750mm of Hg.

Q.3A A siphon draws water from a reservoir and discharges it out at atmospheric pressure. Assuming ideal fluid and the reservoir is large; the velocity at point P in the siphon tube is given by.... 05

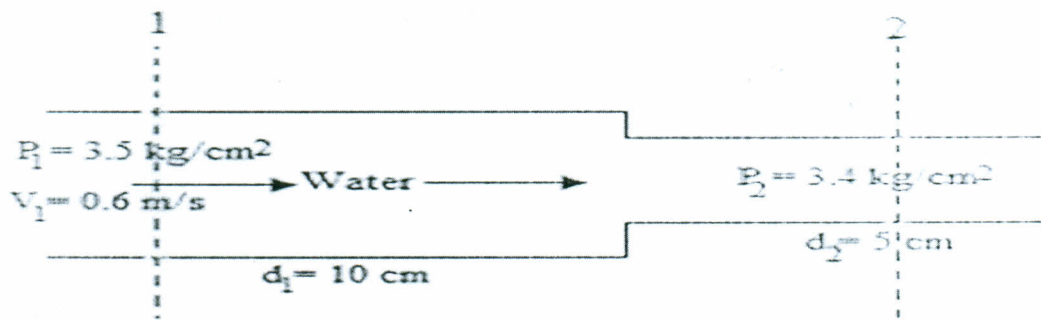


Q.3B The velocity profile in fully developed laminar flow in a pipe of diameter D is given by $u = u_0(1 - 4r^2/D^2)$, where r is the radial distance from the center. If the viscosity of the fluid is μ , find the pressure drop across the length, L , of pipe... 05

Q.4A The equivalent length of the pipe shown in figure: 05



Q.4B The energy loss between sections (1) and (2) of the pipe shown in the given figure is: 05



- Q.5A Explain no slip condition, capillarity and cavitation. 05
- Q.5B Write: i) Archimedes Principle ii) types of equilibrium of a floating body iii) metacenter and metacentric height. 05
- Q.6A Write in brief about circulation. 05
- Q.6B How many types of forces are present in a fluid flow? Write Reynolds equation, N-S equation and Euler's equation for a fluid flow. 05
- OR
- Q.6B What are the boundary conditions for the velocity profiles in a boundary layer. Draw neat figures. 05
- Q.7A Find the expression of rotation for a fluid element. 05
- Q.7B What is drag and lift? What are streamline bodies and bluff bodies? 05
- OR
- Q.7B Write short note on separation of boundary layer. 05
- Q.8 Find the expression for velocity profile of a fully developed laminar flow in a straight circular pipe. Also, find the expression for average velocity in that pipe. Draw neat figures. 10
- Q.9A Find the expression for uni-directional laminar flow between moving parallel plates. Also find the condition for simple shear flow. 10
- Q.9B What is dashpot mechanism? Find the expression for velocity of oil in dashpot mechanism. Draw neat figures. 10
- OR
- Q.9B Find the expression for Hagen-Poiseuille law. Also find the expression for velocity profile for laminar flow in circular pipes and expression for average velocity. 10