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UF-8119

B. E. (Sem. III) (Mech.) Examination

May / June - 2012

Fluid Mechanics

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. (SEM. 3) (MECH.)

Name of the Subject :

☛ FLUID MECHANICS

☛ Subject Code No. : 8 1 1 9 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.

1 Attempt all questions : **10**

(i) Define
  (a) Viscosity
  (b) Newtonian fluid
(ii) Distinguish between Cohesion and Adhesion.
(iii) Define Buoyancy and centre of Buoyancy.
(iv) Give importance of continuity equation.
(v) (a) Fluid is said to be newtonian if it is
  (i) highly viscous
  (ii) incompressible and nonviscous
  (iii) Obey's Newton's law
  (iv) Compressive and Non-viscous
  (b) Absolute pressure is equal to
  (i) Pguge-Patm
  (ii) Patm-Pguage
  (iii) Patm + Pguage
  (iv) Pguage - Pvaccum

2 Attempt any four questions : **20**

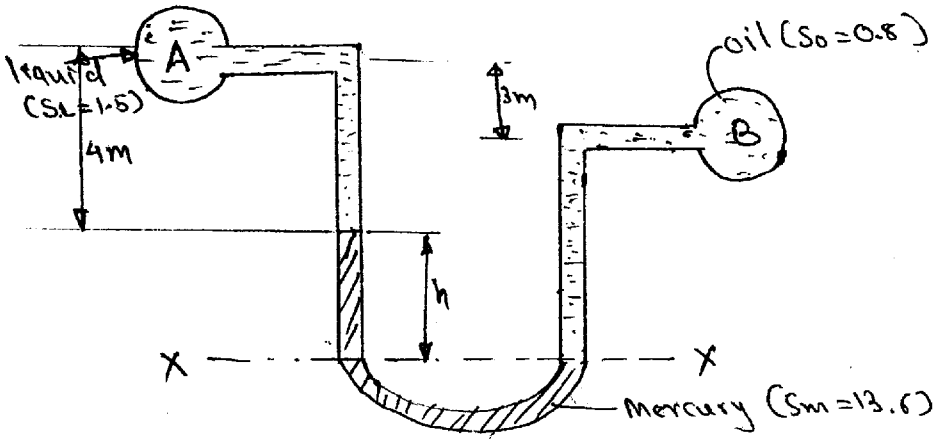
(i) State Pascal's law and prove it. Discuss its application in a real situation.

(ii) Explain stability of immersed and floating body.
(iii) Derive Euler's equation of motion along a streamline and hence obtain Bernoulli's equation.
(iv) Derive continuity equation for 3-D flow and reduce it for steady, incompressible 2-D flow.
(v) Differentiate
  (a) Compressibility and Bulk modulus
  (b) Guage Pressure and absolute pressure

3 Solve any four example : **20**

(i) A 50 mm diameter shaft rotates with 500 rpm in a 80 mm long journal bearing with 51 mm internal diameter. The annular space between the shaft and bearing is filled with lubricating oil of dynamic viscosity 1 poise. Determine the torque required and power absorbed to overcome friction.

(ii) A U-tube manometer connecting two pressure pipes at A and B. The pipe A contains a liquid of specific gravity 1.5 under a pressure of 100 kN/m^2. The pipe B contains oil of specific gravity 0.8 under pressure of 1.5 kN/m^2. The point A is 3m above the point B. The height of liquid in left limb 4m below point A. Calculate the difference in mercury level in the differential manometer.



(iii) A cylindrical block weighs 22 kN having diameter of 2m and height 2.5 m is to float in sea water (S=1.025). Show that it does not float vertically.

(iv) The velocity vector in a flow field is given by
$V = 3x^3i - 12\ x^2yj + 4tk$.
Determine the velosity and acceleration of a fluid particle at (3,2,1) at time t=1.

(v) A horizontal venturimeter of 200 mm × 100 mm is used to measure the discharge of an oil of specific gravity 0.85. A mercury manometer is used for the purpose. If the discharged is 100 liters per second and if the coefficient of discharge of the venturimeter is 0.97, find the difference of mercury level in between two limbs of manometer.

4 (a) Define the following : **5**
(i) Velosity potential function
(ii) Stream function
(iii) Source
(iv) Sinll
(v) Forced vortex flow

(b) Derive the equation of motion for vortex flow. **5**

(c) With a neat sketch describe Reynold's experiment. **5**

5 (a) Derive the Hagen-Poisemille equation for laminar flow. **7**

(b) An oil of viscosity 10 P and specific growth 1.2 flows through a horizontal pipe 80 mm diameter. If the pressure drop in 100 m length of the pipe is 2000 kN/m^2 determine **8**
(i) The rate of flow of oil
(ii) The maximum velocity
(iii) The total frictional drag over 100m length of pipe.
(iv) The power required to maintain the flow
(v) The velocity gradient at the pipe wall
(vi) The velocity and shear stress at 10 mm from wall

OR

5 (a) Derive an expression for the power absorbed in overcoming viscous resistance. **8**

(b) The oil is flowing between two parallel plates kept 0.08 m apart with a maximum velocity of 1.6 m/sec. **7**
Compute :
(i) Discharge of oil per meter width
(ii) The shear stress at the plates
(iii) The pressure difference between two point 50 m apart.
(iv) The velocity at 0.02 m from the plates.
Take viscosity of oil equal to 2.1 N.S/m^2.

6 Attempt any four : **20**

(i) Define compressible flow and differentiate between compressible and incompressible flow.

(ii) Write a short note on shock waves.

(iii) Explain tubulant flow with its characteristics.

(iv) State Buckingham's π-theorem. How the repeating variables are selected in dimensional analysis ?

(v) Write a short note on sin bolt viscometer.
